DECEMBER 2021
ISSN: xxxx
Volume 1,Issue 1 December 2021 Edition

JOURNAL OF MEDICAL LABORATORY SCIENCE BOTSWANA

DDT COLLEGE OF MEDICINE JOURNALS

LEADERS
International Schools
Unleashing Tomorrows Top Leaders

LEADERS INTERNATIONAL

GET YOUR CHILD ENROLLED NOW

TODAY AND UNLEASH THE LEADER!

Leaders Letlhakane	Leaders Thamaga	Leaders Mogoditshane	Leaders Molepolole	Leaders Shashe Mooke	Leaders Mahalapye
+267 7353 8806	+267 7362 5700	+267 7332 1155	+267 73737374	+267 73737374	+267 73737374
PRESCHOOL 3 - 5 YEARS P3000 PER TERM P1100 TUITION PER MONTH PRIMARY SCHOOL P5000 PER TERM P1800 TUITION PER MONTH	PRESCHOOL 3 - 5 YEARS P1800 P500 FOR FOOD PER TERM PRIMARY SCHOOL P3000 P500 FOR FOOD PER TERM	PRESCHOOL P4000 PER TERM PRIMARY SCHOOL STD 1 P6000 PER TERM STD 2 - 7 P7000 PER TERM	Pre-School- P3000 Standard 1-3 P4500 Standard 4-7 P5000 per term Developmental Fee P1000 Registration Fee P300	Pre-School- P3000 Standard 1-3 P4000 Standard 4-7 P5000 per term Developmental Fee P1000 Registration Fee P300	Pre-School- P3000 Standard 1-3 P4500 Standard 4-7 P5000 per term Developmental Fee P1000 Registration Fee P300

HEADQUATERS

+267 73737374
+267 3904924
P O Box 70587 Gaborone
enquaries@leaders-schools.com
www.leaders-schools.com

#LEADER

Unleashing Tomorrow`s Top Leaders

JOURNAL OF MEDICAL LABORATORY
SCIENCE BOTSWANA

Editorial Policy

The Journal of Medical Laboratory operates on open editorial policy and internal peer review. All articles published are reviewed to ensure only relevant and quality articles are published.

The views expressed by the authors of the articles featured in the Journal are their own and do not necessarily represent those of the publisher or the editorial board, and most be cited or quoted as such.

Every care is taken to reproduce articles as accuratelyas possible but the publisher accepts no responsibility for errors, omissions or inaccuracies contained therein.

For article submission or advertising contact the Editor: *journals@ddtcollegeofmedicine.com*

The Journal of Medical Laboratory is a professional and scholarly journal.It will carry only advertising which is likely to be of interest to the medical profession and which does not reflect unfavourably, directly or by implication on the profession medicine.

Advertising which does not comply with this policy will be rejected. It is the responsibility of the advertisers to comply the Botswana Law and regulation pertaining to advertising.

Published by: DDT College of Medicine

Table Of Contents

ARTICLES

Dr Tumelo Tlhoiwe
VICE CHANCELLOR

Vice Chancellor's Message To DDT academics Family and the Nation at large During this COVID-19 Pandemic

The whole world has been affected by Coronavirus, economies have shrunk, loved ones lost but our good lord has sustained us. I encourage everyone to consider research as a priority in order to come up with solutions to fight this pandemic.

The struggle you are in today is developing the strength you need for tomorrow. Being challenged in life is inevitable, but you have the choice to decide how you will react to the situation. Especially now, in this time of covid-19 crisis and uncertainty, change the changeable and accept the unchangeable. We may not be able to see it in the moment, but everything happens for a reason. Use this time to make a difference in your life or in the lives of someone else. Work on all areas of personal growth, spend quality time with family, and focus on goals for the future.

Train yourself to find a blessing in everything, Someone once said these words to me, which have stayed in my mind throughout my life. I truly believe that we are not put into a situation that we cannot conquer. Seeing the light in the midst of darkness is a lesson we all should learn, not only during this difficult time, but all the time. Stay focused on the good and making it better. It can only go up from here.

It's tough to see the light in times of darkness. My advice for all researchers and students is to continue to be positive and never give up hope. It's when we start to lose hope that we begin to struggle mentally. Lend a listening ear to everyone; sometimes all someone needs is a person willing to listen. We all need to come together in this time and continue to check on loved ones, friends, teammates, roommates, and classmates. You never know the impact of what a simple 5 minute phone call could do for someone. Spread that love each and every day.

"Life throws you curves but you learn to swerve." No one is ever really prepared for God's greater plans, but we figure it out, taking it one day at a time. During my time at university, there were some unfortunate events, but we always came together as a community to get it through it as one. Now more than ever, we need to take care of each other. Luckily we live in a world we can talk with friends and family virtually. Take care of yourself and your loved ones. We'll all look back on this time and remember the ones who helped us through this challenging time.

"Nothing in life is to be feared, it is only to be understood. Now is the time to understand more, so that we may fear less."

"A life lived in fear is a life half lived."

VC

Dr Derrick D. Tlhoiwe
CHANCELLOR

Chancellor's Message

To all academic fraternity of DDT College of medicine and beyond, I would like to thank every one of you for your contribution in building Our University college. Thank you for believing in our vision.

DDT continues with its vision as the top medical university in Botswana and draws inspiration from the government of Botswana which has encouraged every citizen to migrate from a minerals-led to a knowledge-based economy, DDT aspires to bring knowledge to Batswana by engaging in state of the art research work and bring solutions to challenging health problems such as the covid-19 pandemic.

Yes our journey has not been smooth, we all understand, "The size of your success is measured by the strength of your desire; the size of your dream; and how you handle disappointment along the way." Disappointments are just God's way to saying 'I've got something better'. Be patient, live life, have faith." We shall overcome every barrier ahead of us for ours is a noble task of improving the lives of Batswana.

I encourage everyone of you to commit to research work, Desire to face the challenge in solving the unsolved problems, concern over practical problems initiates research; Desire to get intellectual joy of doing some creative work; Desire to be of service to society; Desire to get respectability due to your creativity and innovation.

Covid-19 has ravaged many economies, I therefore encourage everyone of you to dedicate considerable amount of time in coming up with solutions to curb this pandemic.

DDT will set aside substantial amount of resources to go into each faculty research work. Your commitment to research will also build your promotion ladder to senior lecturer, assistant professor to full professor.

Last but not the least, I encourage you once again to remember that, The road to success and the road to failure are almost exactly the same it depends on the one you want embrace, Success is not final; failure is not fatal: Opportunities don't happen. You create them , It is the courage to continue that counts. It is better to fail in originality than to succeed in imitation. There are two types of people who will tell you that you cannot make a difference in this world: those who are afraid to try and those who are afraid you will succeed.

Chancellor

Contributors

Featured Contributors

Dr Derrick D. Tlhoiwe
Dr Tumelo Tlhoiwe
Ogorogile Mokate
Paul Moyo
Dr Carlos Alberto Justo Sedeno
Kabo O. Tshiamo
Raymond Chibvongodze
Dr Martinson Danquah
Dr Tapfuma Mudawarima
Suwilanji Chisenge
Dr Larry L. Mweetwa
DDT 2019 Final Year Students

Administrative Assistance

Gofaone R. Masake
Katlego V. Kenosi

Executive Editor

Dr Larry L. Mweetwa

Supporting Partner

Lightning Fast Communications
DDT College of Medicine

Medical Journal Botswana Advertising Rates	
Cover Pages	
Front Cover Inside	BWP 5000
A4 Back Cover	BWP 4000
A4 Back Cover Inside	BWP 4000
Inside Pages	
A4 Full Page	BWP 3000
A4 Half Page	BWP 1500
A4 Quarter Page	BWP 500

EDITORIAL TEAM

Dr Derrick D. Tlhoiwe
Chief Editor

Dr Tumelo Tlhoiwe
Deputy Chief Editor

Ogorogile Mokate
Managing Editor

Paul Moyo
Senior Editor

Raymond Chibvongodze
Assistant Editor

Dr Larry L. Mweetwa
Executive Editor

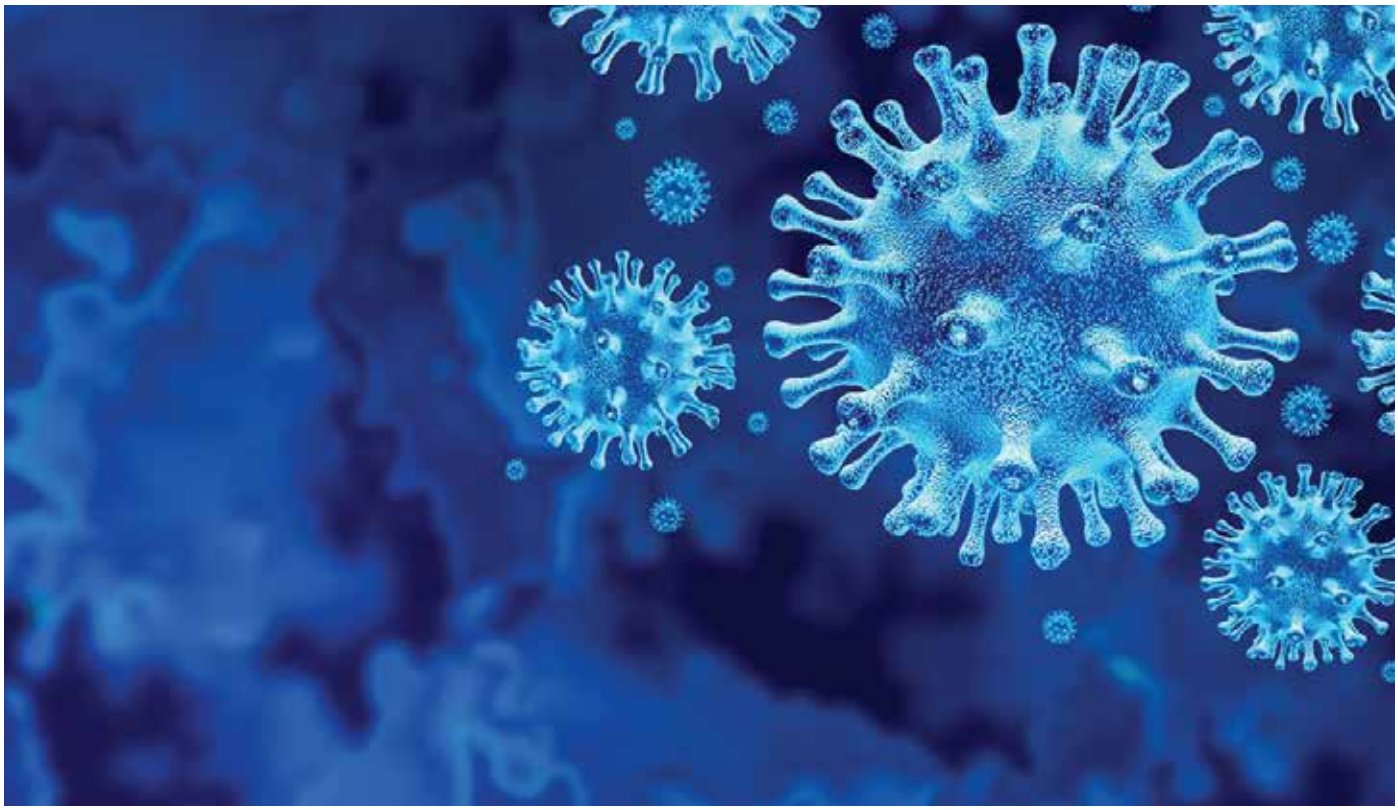
ANALYSIS OF COVID-19 FIRST GENERATION VACCINES DESIGN VIRAL PLATFORMS USED.

Author: *Dr. Larry Mweetwa*

1. Department of Pharmacy and Pharmaceutical Sciences

Corresponding Author *Dr. Larry Mweetwa*
Email: *journals@ddtcollegeofmedicine.com*

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935



Abstract:

Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) or Coronavirus was initially detected in Wuhan, China in December 2019 and has subsequently resulted in the COVID-19 pandemic. The disease presents asymptomatically in some of individuals yet also causes symptoms ranging from those associated with influenza and pneumonia, acute respiratory distress syndrome (ARDS) and even death. The world is currently relying on physical (social) distancing, hygiene and repurposed medicines; however, it is predicted that an effective vaccine will be necessary to ensure comprehensive protection against COVID-19. There has been a global effort to develop an effective vaccine against SARS-CoV-2 with approximately 300 vaccines in clinical trials, and over 200 more in different stages of development. This review provides insight in respect of vaccines, which are in clinical use as of December 2020 and focusses on the Pfizer/ BioN-Tech/Fosun, Moderna mRNA-1273 and AstraZene-ca/Oxford AZD1222 vaccines.

Keywords: Coronavirus; Vaccines; AstraZeneca; Moderna (mRNA-1273); Pfizer, Johnson and Johnson, Gamaleya, Sinopharm, Viral Vector, Sputnik.

1.Introduction

In December 2019 a Coronavirus (COVID-19) outbreak was identified in Wuhan, China which subsequently spread across the globe. The COVID-19 pandemic has been attributed to the acute respiratory syndrome coronavirus-2 (SARS-CoV-2) and exhibits a range of the clinical symptoms some of which are similar to influenza, include acute respiratory distress syndrome (ARDS) and pneumonia in addition to presenting with asymptomatic patients and all may ultimately result in mortality [1]. Initially the pandemic was perceived to be simple to manage with interventions such as physical (social) distancing, use of masks, adequate use of other personal protective approaches including hand sanitizer and face mask use however, at the same time and it was anticipated that the use of existing and new antiviral drugs, and effective vaccines would reduce mortality rates of COVID-19. Perhaps the initial naïve perception that the development of herd immunity through natural development of immunity through infection was the contributor to significant loss of life due to death [1]. By way of example, in Sweden, the authorities presumed that if 60% of the total population had been infected the resultant herd immunity would be adequate to

The comparison of number of infections eliminated by use of the vaccine in the other group was carried out by analysing the difference between r2 and r1 and in this case, it was established that the AstraZeneca vaccine was 73% effective and facilitates removal of 73% of cases which would otherwise occur.

protect the population [1,2].

However, this presumption failed, and a significant number of the Swedish population have since lost their lives due to COVID infection [2]. Consequently, the development of an efficient vaccine has been perceived as the only practical way to ultimately establish herd immunity on the globe. Researchers across the globe have been developing a vaccine for COVID-19 resulting in many vaccine candidates e in different stages of development of which some are in Phase 1 clinical trials [3].

The development of a safe and effective vaccine requires pre-clinical and clinical trials be conducted to minimize the potential of severe adverse effects when used on a large scale [3]. This review will focus on the current vaccines in which a summary of the biological and immune responses observed from previous COVID-19 infections and SARSCoV-2 is provided. In addition, this review describes exploratory and pre-clinical stages of SARS-CoV-2 vaccine development and a discussion regarding the target platform for designing an effective and safe COVID-19 vaccine with relevant clinical trial data. Furthermore, the ethical concerns surrounding the development and production of these vaccines is considered.

2. Immunogenicity to SARS-CoV-2

Recovery following SARS-CoV-2 infection requires a strong immune response and individuals infected with COVID-19 exhibit a strong immune response to the virus which also facilitates their convalescence [4,5]. Current evidence suggests that helper T cells in COVID-19 infected individuals recognise e spike proteins on the SARS-CoV-2 viral architecture. Consequently, T cells play a significant role in elimination of SARS-CoV-2 from the human body [5]. Moreover, the structure of SARS-CoV-2 includes a major trimeric glycoprotein envelope or S-protein located on the surface of the virus facilitating binding to host cells making it a primary target for the development of a successful vaccine.

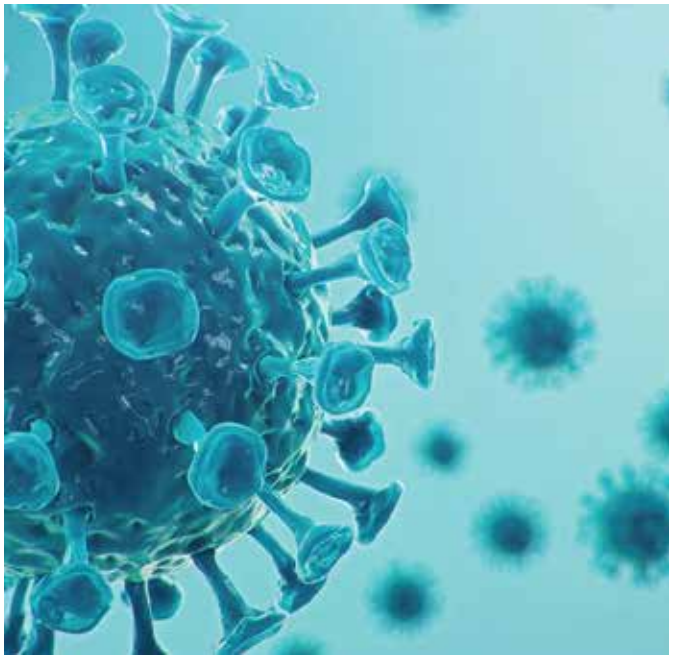
The AstraZeneca COVID-19 (AZD1222) coronavirus vaccine has been developed from a version of the common cold adenovirus [6]. The vaccine contains ChAdOx1, which includes the genetic sequence of the SARS-CoV-2 surface spike (S) protein.The S-protein located on the surface of SARS-CoV-2 is essential for the SARS-CoV-2 virus to infect host cells [6]. Most of the vaccines currently in clinical use have been developed using lipid nano particle-encapsulated mRNA, adenovirus 5 vector that expresses S-protein DNA, nucleoside modified RNA (modRNA) uridine containing Mrna (saRNA), electroporation of DNA plasmid encoding S protein, inactivated virus following viral propagation in cells with a SARS-CoV-2 clinical strain, lentiviral vector dendritic cells modification (LV-DCs and antigen-specific cytotoxic T lymphocytes (CTL) approaches and are schematically represented in Figure 1, the SARS-CoV-2 spike protein binds to ACE2 receptors in order to enter and infect human cells.

The production of a vaccine using spike protein may prime the immune system to attack the coronavirus in subsequent infections.

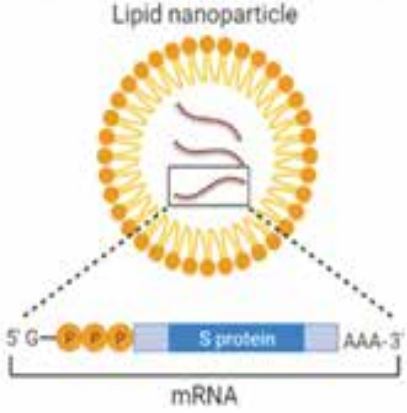
The spike protein is a major surface protein on the CoV virion and is the primary target for neutralising antibodies [7]. The S-protein undergoes dramatic structural re-arrangement when fusing the virus to the cell membrane of the host for viral genome delivery into the target cell. The 2 proline substitutions (2P) on the apex of the central helix stabilises the MERS-CoV, SARS-CoV and HCoV-HKU1 S protein [7].

The release of the SARS-CoV-2 sequence into the hose cell immediately triggers the manufacture of mRNA which expresses the prefusion-stabilised SARS-CoV-2 spike material (fig. 1) [8]. The mRNA-1273 induces potent neutralising antibodies and CD8 T-cell responses and provides protection against SARS-coV-2 [8]. Therefore mRNA-1273 detects and encodes the SARS-CoV-2 prefusion-stabilised spike protein.

BNT162b2 is lipid-nanoparticle formulation containing 5 nucleoside-modified RNA (modRNA) 6 which facilitates encoding of the full-length spike of SARS-CoV-2 [9]. The encoding is modified by two proline mutations for locking into the prefusion confirmation. The doses of BNT162b2 used result in high SARS-CoV-2 neutralising antibody levels in addition to responses from antigen-specific CD8+ and Th1-type CD4+ T-cells as depicted in Figure

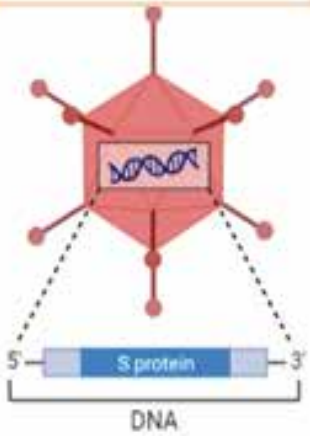


Moderna (mRNA-1273



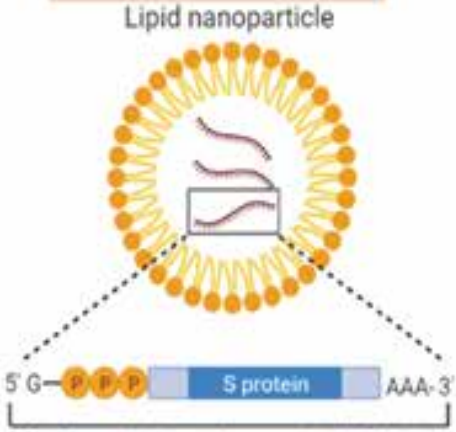
Platform: LNP-encapsulated mRNA encoding S protein.

AstraZeneca/Oxford's AZD 1222



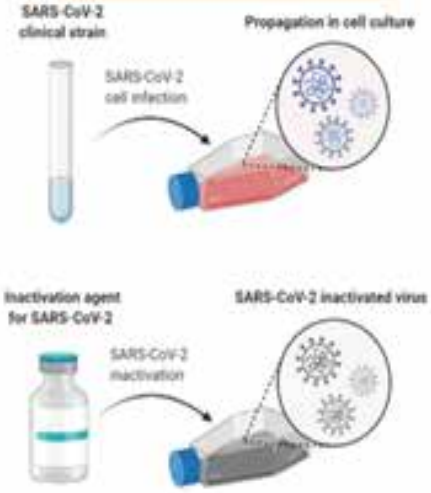
Platform: Adenovirus type 5 vector that expresses S protein.

Pfizer-BioNTech



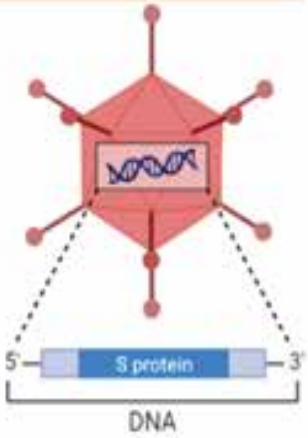
Platform: Nucleoside modified RNA (modRNA)
Uridine containing mRNA (uRNA)
Self-amplifying mRNA (saRNA)

Sinovac Biotech (Sinopharm)



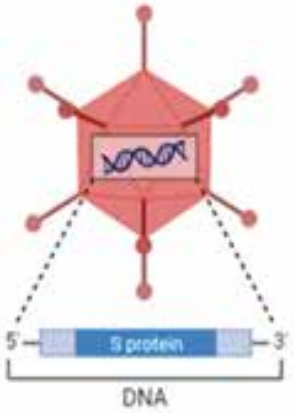
Platform: Inactivated virus vaccine produced from viral propagation in cells infected with a SARS-CoV-2 clinical strain.

Gamaleya (SputinK V)



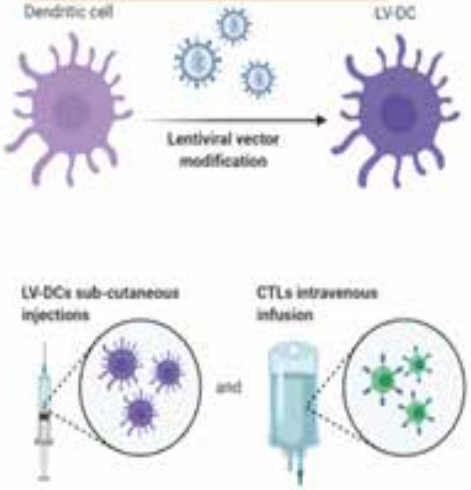
Platform: Adenovirus type 5 vector that expresses S protein.

Johnson and Johnson (Ad26.COV2.S)



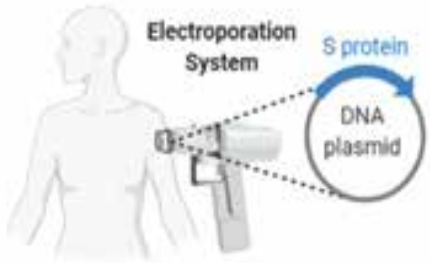
Platform: Genetically modified Adenovirus vector type 5 vector that expresses on S protein and uses double-stranded DNA.

Shenzhen Medical Institute (LV-SMENP-DC)



Platform: Lentiviral vector modification of dendritic cells (LV-DCs) and antigen-specific cytotoxic T lymphocytes (CTLs).

Inovio Pharma (INO-4800)



Platform: Electroporation of DNA plasmid encoding S protein.

3. Exploratory and Pre-Clinical Studies of SARS-CoV-2
Normally the development of new vaccines usually takes between 10 and 15 years whereas the development of a vaccine for COVID-19 over 12-24 months was astounding . The initial vaccine development phase or exploratory stage includes fundamental laboratory research augmented with computational modelling [11] to facilitate identification of natural or synthetic antigens which can be used as vaccine candidates. The second stage of the process includes pre-clinical studies in which cell or tissue culture and human model-based trials are used to establish the safety and immunogenicity of the test vaccine and/or an ability to provoke an immune response [12]. Initially safety, efficacy and immunogenicity are demonstrated in animal models after which clinical trials in small cohorts of human subjects are undertaken [12].

Due to the urgent need to develop prophylactic approaches against COVID-19, several vaccine candidates progressed to the clinical trial stage of development prior to demonstrating efficacy in animal models and provided the idea of pre-clinical research data were used to evaluate the Moderna mRNA vaccine candidate [13]. Vabret et al., the immunisation of mice with mRNA encoding alleviated perfusion and mediates CD8+ T cell response, whilst exhibiting dose-dependent neutralisation SARS-CoV-2 spike trimers by antibodies [14]. Two doses of the mRNA provided in a prime-boost combination to the mice prevented nasal mucosa and lung infections, after challenging SARS-CoV-2 infected mice, however, the trial did not show enhancement of immunopathology in animals receiving sub-protective doses [14].

4. Technology for COVID-19 Vaccine Design

There are many technologies being considered for COVID-19 vaccine development, including DNA, RNA, non-replicating viral vectors and inactivated vaccines [15]. DNA and RNA based vaccines were not developed aggressively nor licenced for human use previously therefore DNA and RNA based vaccines may not be an advantage during a pandemic situation [15]. However, in the light of available evidence DNA and RNA platforms do not require bioreactor culture techniques for production of an inactivated vaccine, and are easily developed in a laboratory as they are based on the genetic sequence of the virus [16]. For this reason DNA and RNA based vaccines for Covid management are under investigation [16]. In contrast non-replicating viral vaccines have been proven safe and effective and can be manufactured on a large scale [17]. As there is an urgent need for a COVID-19 vaccine in the current pandemic situation several DNA, RNA and non-replicating vaccines have been investigated using DNA and RNA platforms.

4.1 RNA Based Vaccines

4.1.1 Moderna mRNA-1273

Moderna is a US-based company that has developed a mRNA-based vaccine referred to as mRNA-1273 [18]. This vaccine codes for the production of spike proteins and administration of the vaccine results in immune cells present in the lymph nodes performing processing of mRNA, resulting in the marking of the protein in humans. The protein is subsequently recognised and marked for destruction. [18]. The Moderna vaccine forms part of the Operation Warp Speed initiative for accelerating the production of a usable vaccine. The preliminary Phase I trial data released by Moderna revealed that the vaccine, tested on mice by immunising them with the doses of 0.01, 0.1

or 1 µg, demonstrated a high pseudovirus NAb response with the 1 µg dose [13]. Moreover, the pseudovirus NAb response was also observed in mice who expressed a mutated form of the spike protein viz., D614G. The 1 µg dose demonstrated a robust and cytotoxic response by T-cells, and balanced responses of Th1/Th2 [13]. The mice did not exhibit increased pathology following administration of the 1 µg dose of vaccine. The Nab levels in mice in response to the 1 µg dose were comparable to that of a 100 µg dose in human subjects with the result that a 100 µg dose was considered necessary for carrying large scale efficacy trials.

4.1.2 BioNTech BNT162

The collaboration between the German company BioNTech and American company Pfizer resulted in the development of an mRNA-based vaccine for encoding the RBD domain of the SARS-CoV-2. The BNT162 product incorporates modified mRNA and includes a trimerisation domain derived from T4 fibritin [19]. For the phase I trial 45 healthy volunteers who were separated into groups to receive 10 µg, 30 µg, and 100 µg doses, were recruited and 9 participants received a placebo dose [19]. On the basis of the interim data, the participants demonstrated an increased level of IgG, which increased and remained elevated for 14 days following the second dose [19]. Individuals who received the 100 µg dose did not exhibit an increase for one day after vaccination, and exhibited peak IgG levels at 21 days following the initial dose [19]. The individuals who received the 100 µg dose did not receive the second booster dose and based on this information no difference between the health outcomes of individuals who received doses of 30 µg and 100 µg were observed [19].

4.2 Non-Replicating Viral Vectors Vaccines

The University of Oxford in partnership with AstraZeneca, a British pharmaceutical company, developed a viral vaccine, previously referred to as ChAdOx1. The pre-clinical trials for this vaccine were undertaken in a porcine model with a large antibody response observed [20]. A randomised controlled trial with 1077 healthy individuals was performed in the UK with participants receiving either 5 × 1010 vaccine particles or the meningococ

cal vaccine MenACWY [21]. The participants were further subdivided and categorised on the basis of paracetamol prophylaxis as this was used as a to reduce adverse events. The production of a recombinant adenovirus for ChAdOx1 nCoV-19 was undertaken and administered at a dose of 5 × 1010 viral particles dose by intramuscular injection [21]. Local and systematic events were fewer in individuals in the paracetamol group when compared to those individuals who received no prophylaxis [21]. However, liver enzyme upregulation through paracetamol use was not considered in this evaluation.

4.3 DNA-Based Vaccines

The American company Inovio developed the DNA-based INO-4800 vaccine. which is injected into the dermis after which electroporation is applied to ensure uptake into cells. The participants were divided into two groups who were administered a high (2mg) or low (1mg) dose [22]. The analysis of adverse events revealed that 28% of the individuals experienced Grade I adverse events after two months [22].

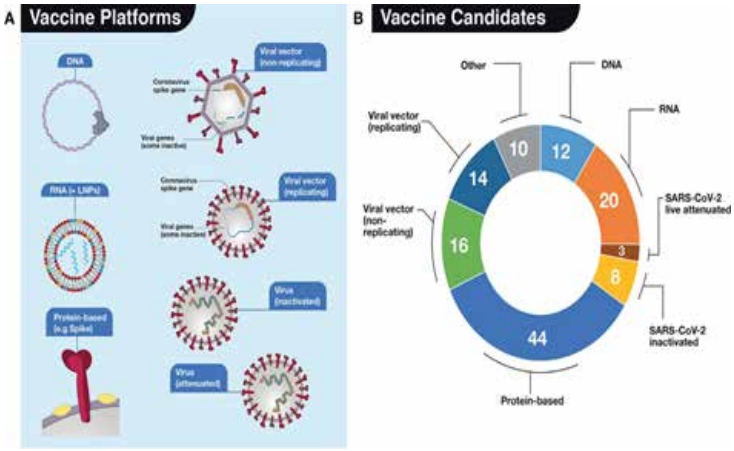


Figure 3: Vaccine platforms and candidates for SARS-CoV-2 and the COVID-19 (Adapted from Funk et al. [23])

5. Unpacking clinical trials data for SARS-CoV-2 vaccines currently under investigation

5.1 mRNA-1273

The primary endpoint for establishing the efficacy of the mRNA-1273 vaccine is the prevention of COVID-19 symptoms within at least 14-days following a second injection [24]. The efficacy levels of the mRNA-1273 were analysed and the consistency of the vaccine at the primary endpoint evaluated in subgroups for age, e health-related risk for severe disease, gender, race, and ethnic groups in addition to risk for COVID-19 [24]. A secondary endpoint was defined in terms of mRNA-1273 efficacy in preventing severe COVID-19, with reference to pre-defined criteria which included a respiration rate of > 30 breathes per minute, heart rate of > 125 beats per minute, oxygen saturation of 93% or lower less (the oxygen partial pressure to the oxygen reaction inspired ratio of < 300 mm Hg), acute respiratory distress syndrome and respiratory failure [24]. The criteria used included clinically significant neurologic, hepatic, renal dysfunction in addition to admission history to the intensive care unit. Some additional secondary endpoints included the efficacy of the vaccine to prevent COVID-19.Of interest solicited adverse events at the injection site were more frequent in the mRNA-1273 group compared to the placebo group [24]. Following the first dose, solicited adverse events totalled 84.2% in the mRNA-1273 and 19.8% in the control groups whereas, following the second dose the solicited adverse events were 88.6% in the mRNA-1273, and 18.8% in the control groups. The severity of injection site events in the mRNA-1273 group were reported as grade 1 and grade2 and observed more frequently in individuals who were SARS-CoV-2 positive at baseline when compared to subjects who were negative at the baseline [24].

The efficacy of mRNA-1273 vaccine was calculated by determining the difference in ratio of infected individuals in the control and vaccinated groups, respectively.

The number of individuals in the vaccine group was n1= 15000 and in the control group n2= 15000. In the vaccinated group, x1=11 individuals were infected by the virus, whereas in the control group x2=185 individuals were infected by the virus during the study [24]. The ratios of the infected individual within the vaccine group, 'r1' was 0.000733, whereas the ratios of the infected individual within the control group, 'r2' was 0.012333. The analysis of ratio of infection in the mRNA-1273, and placebo group revealed that a greater number of individuals were infected in the control group. Efficacy was determined by considering the difference in the ratios 'r1'and 'r2', which revealed that mRNA-1273, vaccine was 94% effective and facilitates removal of 94% of cases which would otherwise occur.

$$r1=x1/n1$$
$$r1=11/(15000\ )$$
$$r1=0.000733$$
$$r2=x2/n2$$
$$r2=185/15000$$
$$r2=0.012333$$
$$E=(r2-r1)/r2$$
$$E=(0.012333-0.000733)/0.012333$$
$$E=0.94$$
$$E=94\%$$

Where,

n1= Number of individuals in control group
n2= Number of individuals in vaccinated group
x1= Number of individuals in control group infected by virus
x2= Number of individuals in vaccinated group infected by virus
r1= Ratio of individuals in control group infected by virus to the total number of individuals in the control group
r2= Ratio of individuals in vaccinated group infected by virus to the total number of individuals in the vaccinated group
E= Difference in the ratios of infected individuals in the control and vaccinated groups.

5.2 BioNTech BNT162

The efficacy of the BNT162b2 vaccine by considering primary and secondary endpoints was reported by Polack et al. [9]. The primary endpoint was efficacy of BNT162b2 against confirmed cases of COVID-19 within at least 7 days onset following administration of the second dose and secondary endpoints included the efficacy of BNT162b2 against severe COVID-19 infection [9]. The effectiveness of the vaccine was estimated using,

Where,

IRR is the ratio of confirmed cases of COVID-19 illness per 1000 individuals.

Analysis of reactogenicity revealed that recipients of the BNT162b2 vaccines exhibited more local reactions and mild to moderate pain at the site of injection within seven days of treatment when compared to the placebo group [9]. Analysis of systemic reactogenicity revealed that events including headache and fatigue were experienced by 59% and 52% of the younger participant in the BNT162b2 group, whereas the event rate in the placebo group was comparatively lower after the first and second doses [9].

The number of individuals in the vaccine group was n1= 21720 and the control group n2= 21728. In the treatment group x1=8 individuals were infected by the virus, whereas, in the control group x2=162 individuals were infected by the virus [9]. The ratios of the infected individual within the vaccine group, 'r1' was 0.000368, whereas, the ratios of the infected individual within the control group, 'r2' was 0.007456. Analysis of the ratio of infection in the BNT162b2, and placebo groups revealed that a greater number of individuals were infected in the control group. In the analysis of data if the control group provides the rate of infection in the absence of using a vaccine, the number of infections eliminated by use of the vaccine in the other group is established by comparing the difference between r2 and r1 and in this case, it was found that the BNT162b2 vaccine was 95% effective and facilitates removal of 95% of cases which would otherwise occur

r1=x1/n1
r1=8/(21720)
r1=0.00036
r2=x2/n2
r2=162/21728
r2=0.007456
E=(r2-r1)/r2
r2=(0.007456-0.000368)/0.00
7456
E=0.95
E=95%

Where,
n1= Number of individuals in control group
n2= Number of individuals in vaccinated group
x1= Number of individuals in control group infected by virus
x2= Number of individuals in vaccinated group infected by virus
r1= Ratio of individuals in control group infected by virus to the total number of individuals in the control group
r2= Ratio of individuals in vaccinated group infected by virus to the total number of individuals in the vaccinated group
E= Difference in the ratios of infected individuals in the control and vaccinated groups.

5.3 AstraZeneca

According to the MHRA Information for Healthcare Professionals [25], the levels of protection following a single dose of the AstraZeneca vaccine were evaluated by exploratory data analysis by including participants who had received one dose of the vaccine [25]. Participant data were removed from the analysis performed as soon as possible following administration of the second dose, 12 weeks after the first dose [25].

Vaccine efficacy analysis revealed that 22 days post-dose, efficacy of the vaccine was 73% with 95% CI limits of 48.79 and 85.76 [25]. It was also observed that hospitalisation was reduced from 21 days after the first dose up to two weeks after the second dose. Consequently, it is likely that a single dose of the AstraZeneca vaccine will provide short-term protection against COVID-19 infection [25]. Protective immunity from the first dose was reported to last for up to 12 weeks. Exploratory analyses suggest that increased immunogenicity was highly correlated to a longer dose interval. In this exploratory trial the number of individuals in the vaccine group was n1= 7998 and the control, group n2= 7982 [25].

In the vaccinated group x1=12 individuals were infected by the virus following treatment whereas, in the control group, x2=44 individuals were infected by the virus. The ratio of infected individual within the vaccine group, 'r1' was 0.001500, whereas the ratio of the infected individual within the control group, 'r2' was 0.005512. Analysis of the ratio of infection with the AstraZeneca vaccine and placebo groups revealed that a greater number of individuals were infected in the control group.

r1=x1/n1
r1=12/(7998)
r1=0.001500
r2=x2/n2
r2=44/(7982)
r2=0.005512
E=(r2-r1)/r2
E=(0.005512-0.001500)/0.005
512

E=0.72786
E=73%

Where,
n1= Number of individuals in control group
n2= Number of individuals in vaccinated group
x1= Number of individuals in control group infected by virus
x2= Number of individuals in vaccinated group infected by virus
r1= Ratio of individuals in control group infected by virus to the total number of individuals in the control group
r2= Ratio of individuals in vaccinated group infected by virus to the total number of individuals in the vaccinated group
E= Difference in the ratios of infected individuals in the control and vaccinated groups.

6. Uncovering Clinical Data

6.1 Johnson and Johnson

The efficacy and safety of the Janssen COVID-19 candidate vaccine for protection against moderate to severe COVID-19 was evaluated in a phase 3 clinical trial by considering co-primary endpoints of 14 and 28 days after vaccination [26]. It was found that the Janssen candidate was 66% effective for the prevention of moderate to severe COVID-19 at 28 days after vaccination. A single dose of the Johnson & Johnson vaccine showed a 66% percent effectiveness at preventing moderate to severe disease from COVID-19 and 85% at preventing severe disease. However, there were variations in efficacy in regional clinical trials when evaluated for moderate to severe COVID-19 with a 72% effectiveness in the United States, 57% in South Africa and 66% in Latin America reported. The vaccine also exhibited good results when multiple variants of COVID-19, such as B.1.351 variant found in South Africa were tested.

Johnson and Johnson [27] reported that the onset of protection was also observed as early as the 14th day of infection. The Janssen COVID-19 vaccine provided complete protection against COVID-related hospitalisation and death 28 days after vaccination. The vaccine was reported to have a clear effect on the number of COVID-19 cases requiring extracorporeal membrane oxygenation (ECMO), mechanical ventilation, or other medical interventions.

6.2 Gamaleya

The Sputnik V vaccine developed by Gamaleya is based on a human adenoviral vector platform and makes use of adenovirus 26 (Ad26) and 5 (Ad5) as vectors to express the genetic sequence of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spike protein [28]. Logunov et al. [28] reported the interim results from a phase 3 clinical trial of the Sputnik V COVID-19 vaccine and the results revealed that the vaccine provided strong protection in all age groups that participated [29]. The efficacy of the vaccine established by monitoring confirmed cases of COVID-19 from 21 days after vaccine administration revealed 91.6% efficacy (95% CI 85•6–95•2) [29] and was equally effective in individuals in all age groups.

6.3 Sinopharm

Sinopharm, a pharmaceutical company based in the Republic of China, have developed an inactivated SARS CoV-2 vaccine, which has been administered to approximately 1 million individuals [30]. Additional phase 3 trials of the vaccine are currently being undertaken in Indonesia and Turkey [30]. In Brazil, the vaccine has been administered intramuscularly to participants in two different doses provided at an interval of 14 days [30]. The Sinopharm vaccine has been reported to be 79% effective [31] however, efficacy trials on the same product have p roduced efficacy data of 50%, 65%, 78% and 91% [32].

7.Ethical Considerations Surrounding Vaccine Development and Production

A concerted application of science and technology is required to ensure that the research undertaken in respect of the COVID-19 outbreak includes risk assessment, management, vaccine development, and production whilst always promoting human rights. The development and production of an effective vaccine for dealing with the pandemic is y dependent on the outcomes of appropriately designed clinical and non-clinical trial outcomes performed in vitro, in animal and human subjects [33]. For this reason, there is a bioethical debate surrounding the trials conducted in respect of these vaccines developed during the pandemic. In respect of the COVID-19 situation, no vaccine has been proven to be effective for treatment of the disease and therefore an ethical dilemma when including healthy subjects for testing the efficacy of the vaccine exists [34]. The development and production of vaccines during pandemics is always likely to raise ethical concerns.

8. Challenges of Acquisition and Distribution of SARS-CoV-2 Vaccine in Middle- and Low-Income Developing Nations.

The rapid spread of the contagion crosses the globe and within less developed countries in Asia and Africa has resulted in a significant global health emergency. Countries require context-specific responses dependent on the prevailing situation such as number of COVID-19 cases ranging from none to a limited number or increased number of cases [32]. Decisive actions are required and effective physical (social) distancing, use of quarantine and/or lockdowns, implementation of widespread testing, contact tracing in a systematic manner are necessary to reduce the risk of further spread of the disease [32]. In combination with extensive testing the distribution of vaccines in low income developing counties is a significant challenge due to conflict, over population in rural and urban areas, and lack of accessibility to basic health services [30]. In developing countries, the most significant challenge includes the need for systematic decontamination measures and massive testing to reduce the risk of a devastating outbreak. The acquisition of COVID-19 vaccines requires an in-depth analysis of the changing epidemiology of the disease including the period of incubation between appearance and duration of symptoms [35].

The distribution of a vaccine is currently determined by considering an ability to develop and initiate testing and purchase vaccines [35]. A small number of multinational companies produce most of the vaccines globally and are also involved in negotiating with the private and public[36] sectors to sell their vaccines. In this respect developed countries of the

world attempt to purchase access to vaccine candidates well in advance whereas due to a lack of resources, developing countries are unlikely to have early access the vaccines [35]. Consequently there is likely to be inequitable access and an unethical allocation of vaccines, depending on the ability of countries to pay for vaccines and distributive justice is one of the fundamental considerations necessary when distributing vaccines during such a pandemic so as to ensure that the principles of distributive justice are met and the allocation of scarce resources are applied equally to all viz., local, national and global communities [35]. However, the limited supply of vaccines and the mass demand during pandemic situations is a challenge when aspiring to equal distribution of resources.

The lack of accessibility to vaccines and storage conditions required may result in failure to achieve desired clinical outcomes even if bulk distribution of vaccines to developing countries was successful [31]. The inadequate refrigerated cold chain network in many developing countries therefore poses a significant challenge. Consequently vaccine candidates for COVID-19 requires that require long term storage at -20 °C to -70°C are likely to result in the loss of vaccine particularly if inadequate refrigerated cold chain networks exist [32]. Therefore, the acquisition, distribution and successful clinical application of SARS-CoV-2 vaccine in low- and middle-income developing nations may be extremely challenging.

9. Conclusions

In light of the analysis and review of the vaccines that have been developed and approved for emergency use in many countries it is evident that grey areas exist and scientists are yet to establish conclusive solutions to ensure successful treatment strategies. Similar concerns are shared by the World Health Organization (WHO) in that assurance of long-term immunity or estimated time of immunity protection with the current vaccines are not yet known. In addition, there is no certainty of immune response or durability thereof. Evidence from the clinical trial data has revealed that the current vaccines have a e capability to protect some individuals against disease but are not conclusive in respect of an ability to prevent transmission and subsequent infection following exposure to the COVID-19 virus.

Furthermore, there is a dearth of evidence regarding the age-related use of these vaccines as, by way of example, the use of the vaccine in paediatric subjects has not yet been undertaken and efficacy established and as such these populations remain at risk to transmission and infection by the virus.

An additional concern relates to the availability of the sufficient vaccine doses to cater for entire communities and/or populations so as to ensure protection to a significant number and wide range of individuals, which may reduce confidence in the current intervention strategy and fight against COVID-19.

Consequently, it is recommended that adherence to COVID-19 protocols such as hand sanitization, physical distancing and wearing of masks is maintained despite the state of vaccination of an individual or population as the COVID-19 pandemic

REFERENCES

Randolph, H.E.; Barreiro, L.B. Herd Immunity: Understanding COVID-19. Immunity 2020, 52, 737–741, doi:10.1016/j.immuni.2020.04.012.

2. Jung, F.; Krieger, V.; Hufert, F.T.; Küpper, J.H. Herd immunity or suppression strategy to combat COVID-19. Clin. Hemorheol. Microcirc. 2020, 75, 13–17, doi:10.3233/CH-209006.

3. Netea, M.G.; Joosten, L.A.B.; Latz, E.; Mills, K.H.G.; Natoli, G.; Stunnenberg, H.G.; O'Neill, L.A.J.; Xavier, R.J. Trained immunity: A program of innate immune memory in health and disease. Science (80-.). 2016, 352, 427, doi:10.1126/-science.aaf1098.

4. Grifoni, A.; Weiskopf, D.; Ramirez, S.I.; Mateus, J.; Dan, J.M.; Moderbacher, C.R.; Rawlings, S.A.; Sutherland, A.; Premkumar, L.; Jadi, R.S.; et al. Targets of T Cell Responses to SARS-CoV-2 Coronavirus in Humans with COVID-19 Disease and Unexposed Individuals. Cell 2020, 181, 1489-1501.e15, doi:10.1016/j.-cell.2020.05.015.

5. Johnson, Z.I.; Zinser, E.R.; Coe, A.; McNulty, N.P.; Woodward, E.M.S.; Chisholm, S.W. Niche partitioning among Prochlorococcus ecotypes along ocean-scale environmental gradients. Science (80-.). 2006, 311, 1737–1740, doi:10.1126/science.1118052.

6. Mellet, J.; Pepper, M.S. A covid-19 vaccine: Big strides come with big challenges. Vaccines 2021, 9, 1–14, doi:10.3390/vac-cines9010039.

7. Anderson, E.J.; Rouphael, N.G.; Widge, A.T.; Jackson, L.A.; Roberts, P.C.; Makhene, M.; Chappell, J.D.; Denison, M.R.; Stevens, L.J.; Pruijssers, A.J.; et al. Safety and Immunogenicity of SARS-CoV-2 mRNA-1273 Vaccine in Older Adults. N. Engl. J. Med. 2020, 383, 2427–2438, doi:10.1056/nej-moa2028436.

8. Dong, Y.; Dai, T.; Wei, Y.; Zhang, L.; Zheng, M.; Zhou, F. A systematic review of SARS-CoV-2 vaccine candidates. Signal Transduct. Target. Ther. 2020, 5, doi:10.1038/s41392-020-00352-y.

9. Polack, F.P.; Thomas, S.J.; Kitchin, N.; Absalon, J.; Gurtman, A.; Lockhart, S.; Perez, J.L.; Pérez Marc, G.; Moreira, E.D.; Zerbini, C.; et al. Safety and Efficacy of the BNT162b2 mRNA Covid-19 Vaccine. N. Engl. J. Med. 2020, 383, 2603–2615, doi:10.1056/nejmoa2034577.

10. Biorender Immunogenecity to SARS-CoV-2 2021.

11. Han, S. Clinical vaccine development. Clin. Exp. Vaccine Res. 2015, 4, 46, doi:10.7774/cevr.2015.4.1.46.

12. Singh, K.; Mehta, S. The clinical development process for a novel preventive vaccine: An overview. J. Postgrad. Med. 2016, 62, 4–11, doi:10.4103/0022-3859.173187.

13. Corbett, K.S.; Edwards, D.K.; Leist, S.R.; Abiona, O.M.; Boyoglu-Barnum, S.; Gillespie, R.A.; Himansu, S.; Schäfer, A.; Ziwawo, C.T.; DiPiazza, A.T.; et al. SARS-CoV-2 mRNA vaccine design enabled by prototype pathogen preparedness. Nature 2020, 586, 567–571, doi:10.1038/s41586-020-2622-0.

14. Vabret, N. Antibody responses to SARS-CoV-2 short-lived. Nat. Rev. Immunol. 2020, 20, 519, doi:10.1038/s41577-020-0405-3.

15. Sharma, O.; Sultan, A.A.; Ding, H.; Triggle, C.R. A Review of the Progress and Challenges of Developing a Vaccine for COVID-19. Front. Immunol. 2020, 11, doi:10.3389/fimmu.2020.585354.

16. Conforti, A.; Marra, E.; Roscilli, G.; Palombo, F.; Ciliberto, G.; Aurisicchio, L. Are Genetic Vaccines the Right Weapon against COVID-19? Mol. Ther. 2020, 28, 1555–1556, doi:10.1016/j.ymthe.2020.06.007.

17. Sharpe, H.R.; Gilbride, C.; Allen, E.; Belij-Rammerstorfer, S.; Bissett, C.; Ewer, K.; Lambe, T. The early landscape of coronavirus disease 2019 vaccine development in the UK and rest of the world. Immunology 2020, 160, 223–232, doi:10.1111/imm.13222.

18. Triggle, C.R.; Bansal, D.; Farag, E.A.B.A.; Ding, H.; Sultan, A.A. COVID-19: Learning from Lessons To Guide Treatment and Prevention Interventions. mSphere 2020, 5, doi:10.1128/msphere.00317-20.

19. Mulligan, M.J.; Lyke, K.E.; Kitchin, N.; Absalon, J.; Gurtman, A.; Lockhart, S.; Neuzil, K.; Raabe, V.; Bailey, R.; Swanson, K.A.; et al. Phase I/II study of COVID-19 RNA vaccine BNT162b1 in adults. Nature 2020, 586, 589–593, doi:10.1038/s41586-020-2639-4.

20. Graham, S.P.; McLean, R.K.; Spencer, A.J.; Belij-Rammerstorfer, S.; Wright, D.; Ulaszewska, M.; Edwards, J.C.; Hayes, J.W.P.; Martini, V.; Thakur, N.; et al. Evaluation of the immunogenicity of prime-boost vaccination with the replication-deficient viral vectored COVID-19 vaccine candidate ChAdOx1 nCoV-19. bioRxiv 2020, doi:10.1101/2020.06.20.159715.

21. Folegatti, P.M.; Ewer, K.J.; Aley, P.K.; Angus, B.; Becker, S.; Belij-Rammerstorfer, S.; Bellamy, D.; Bibi, S.; Bittaye, M.; Clutterbuck, E.A.; et al. Safety and immunogenicity of the ChAdOx1 nCoV-19 vaccine against SARS-CoV-2: a preliminary report of a phase 1/2, single-blind, randomised controlled trial. Lancet 2020, 396, 467–478, doi:10.1016/S0140-6736(20)31604-4.

22. Tebas, P.; Yang, S.P.; Boyer, J.D.; Reuschel, E.L.; Patel, A.; Christensen-Quick, A.; Andrade, V.M.; Morrow, M.P.; Kraynyak, K.;

EVALUATION OF FACTORS THAT INFLUENCE TUBERCULOSIS PREVALENCE GLOBALLY

Authors: *Godiraone Ramatlhaga*

1. Department for Medical Laboratory Science, DDT College of Medicine.

2. Department of Medicine, DDT College of Medicine.

Corresponding Author *Dr Derrick D.Tlhoiwe, Dr Tumelo Tlhoiwe, Larry.L. Mweetwa*
Email: *journals@ddtcollegeofmedicine.com*

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935

Abstract

Tuberculosis (TB) is an infectious disease induced by different Mycobacterium strains. According to Sharma and Bhatia, (2004) Mycobacterium tuberculosis (MT) is the most prevalent type of TB. Tuberculosis continues to be a major public health problem worldwide. WHO estimates, in 2017 there were 10.0 million new cases of tuberculosis (TB) and 1.6 million deaths. Despite all the significant effort to control, treat and new diagnostic method, TB remains a human threat and is of public health importance. Several studies have reported that the high burden of TB is increased by factors such as diabetes, HIV, nutrition, smoking, alcohol, poverty and overcrowding (Millet et al., 2011, Narasimhan et al., 2013).

Key words: Tuberculosis, Systematics review, Global, Risk factors, Prevalence

Background

Tuberculosis (TB) is an infectious disease induced by different Mycobacterium strains. According to Sharma and Bhatia, (2004) Mycobacterium tuberculosis (MT) is the most prevalent type of TB. Because of its serious psychological and social expenses, Mycobacterium tuberculosis has always been a constitutive challenge throughout human history, and they also hypothesized that the genus Mycobacterium originated more150 million years ago (Barberis et al., 2017).
According to Tang et al., (2006) like the common cold, TB is spread through aerosolized droplets after infected people cough, sneeze or even speak. When a person with a good immune system breathes TB bacteria, they will have 10% opportunity of developing TB in their lifetime (Millet et al., 2013). However if a person's immune system is compromised/ becomes compromised, the bacteria will begin to multiply. Bacteria from the lungs can migrate through the blood to other components of the body like the kidney, spine, and brain.
Epidemiology of tuberculosis

Tuberculosis continues to be a significant cause of morbidity and mortality worldwide. It is one of the top 10 death causes and the leading cause of a single infectious agent worldwide. Tuberculosis influences all ages and all genders. In 2015, it was estimated that 10.4 million individuals globally suffered from TB with 1.4 million TB deaths (Global Tuberculosis Report 2016). In 2016, the same amount of TB diseases recorded globally was estimated at 10.4 million and India (25%), Indonesia (16%) and Nigeria (8 %) were the top three among ten nations, accounting for 76% of the total incidence difference between TB and reported instances (Global Tuberculosis Report 2017). According to the 2018 Global Tuberculosis Report, however, 10 million individuals developed TB disease in 2017; 5.8 million were males, 3.2 million were females and 1.0 million were children. Of the approximately 10 million individuals infected with TB in 2017, 1.6 million died. TB cases

were reported in all countries and age groups but generally 90% were adults (aged >15), 9% were individual living with HIV (72% in Africa), and two thirds were in eight nations; India (27%), China (9%), Indonesia (8%), the Philippines (6%), Pakistan (5%).

World Health organization, (2009) state that for the first half of the 20th century X-ray was the number one tool worldwide for the diagnosis of TB, particularly pulmonary tuberculosis. Although X-ray was the number one tool worldwide Ryu, (2015) state that it lacks specificity hence it can be normal even when the disease is present. Diagnostic method of TB include sputum smear microscopy with Ziehl-Neelsen (ZN) staining, which is the widely used tool in resource limited settings .It is highly specific but has a variable sensitivity (20%–80%) (Kivihya-Ndugga et al.,2003).

Although the culture technique is deemed the gold standard for the diagnosis of tuberculosis, it requires a long time of 4-8 weeks for the final outcome to be obtained, causing a delay in the diagnosis and treatment. It also needs appropriate infrastructure and technical knowledge (Norbis et al., 2014).Liquid culture has the advantages of a shorter time required and its ability to perform drug susceptibility testing; it also requires a well-equipped laboratory, besides its increased tendency for contamination (Batz et al., 2011).

Molecular method Xpert MTB RIF assay provides results directly from sputum in less than 2 hours (Piatek et al., (2013). Xpert MTB/RIF detects both TB and rifampicin resistance in a single test. It can detect drug-resistant and HIV associated TB, in particular with regard to speed, standardized testing, potential for high throughput, and reduced biosafety needs (Steingart et al., 2013). WHO recommends that Xpert MTB / RIF be used as an initial diagnostic test in people suspected of MDR-T B or HIV-associated TB rather than standard microscopy, culture and substance susceptibility testing (DST). However, Xpert MTB / RIF technology does not exclude the need for standard culture of microscopy and DST to monitor the progress of therapy and detect drug resistance other than rifampicin (Steingart et al., 2013).

In 1993, WHO's Global Tuberculosis Programme (GTB) established the Directly Observed Treatment Short-course) (DOTS) as a strategy to control TB. The DOTS strategy combines 5 elements, 1.Government commitment to sustained TB control activities, 2. Case detection by sputum smear microscopy among symptomatic patients self-reporting to health services, 3.Standardized treatment regimen of six to eight months for at least all confirmed sputum smear positive cases, with directly observed treatment (DOT) for at least the initial two months, 4. A regular, uninterrupted supply of all essential anti-TB drugs, 5.A standardized recording and reporting system that allows assessment of treatment results for each patient and of the TB control programme overall.

The effective drug treatments were first developed in the 1940s, and the most effective first line anti-TB drug, rifampicin, became available in the 1960s (Global tuberculosis Report 2015). A six-month regimen of four first-line drugs is presently suggested for fresh drug susceptible TB instances: isoniazid, rifampicin, ethambutol and pyrazinamide. Multidrug resistant TB (MDR-TB) is defined as resistance to drug isoniazid and rifampicin (the two most powerful anti-TB drugs). According to Hayward et al., (2018) the bacilli Calmette Guérin (BCG) vaccine, which was developed almost 100 years ago and has been shown to prevent severe forms of TB in children, is still widely used. There is currently no vaccine that is effective in preventing TB disease in adults, either before or after exposure to TB infection (Global Tuberculosis Report 2018).

RESEARCH AIM

The research aim of the study is to carry out a systematic review in order to evaluate factors that influence TB prevalence globally

OBJECTIVES

1. To identify factors that influence tuberculosis prevalence globally
2. To assess how the factors influence tuberculosis prevalence globally

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Out of 70 studies identified, 58 were left after duplicates were removed. 38 were excluded due to having abstracts only, poor methodology, means of comparison were inappropriate. Out of the 20 selected, 10 were further excluded due to year of publication and from the 10 left 5 were excluded due to unsatisfactory results and conclusion. Only 5 were finally used.

Fig 1.0 | Prisma Flow Chart

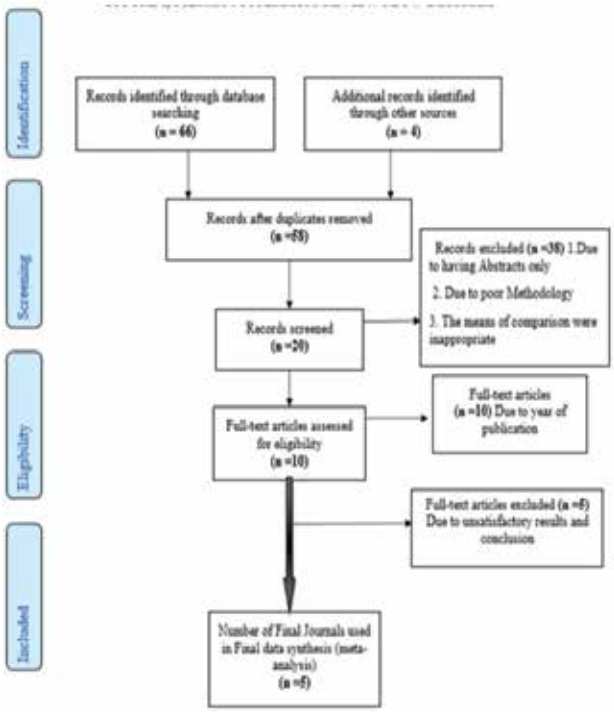
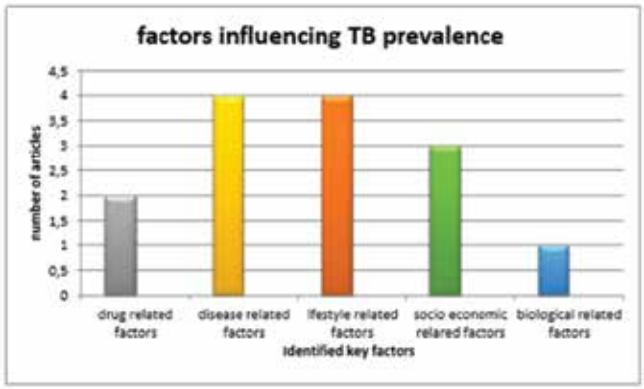


Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

Disease related factors

The bar graph in Fig 2 indicates that disease related factors are the major predisposing factors for TB. This study supports the fact that diseases such as HIV and diabetes represent a major risk for TB occurrence.
HIV coinfection is the most potent immunosuppressive risk factor for developing active TB disease (Shanmuganathan et al., 2015). HIV greatly increases the chances of reactivation of latent infection of TB and increases the rapid TB progression following primary infection or reinfection with TB (Narasimhan et al., 2013). Studies in countries with high HIV prevalence have also shown that TB incidence is strongly associated with the prevalence of HIV infection (Kaplan et al., 2018, Saad et al., 2014).

DM is another major risk factor TB. Diabetic patients have been found to be about a threefold increased risk of developing TB when compared to those without diabetes (Shetty et al.,2006). Hayward et al., (2018) did a similar study and found out that DM increases the risk of active TB 3.11-fold.

Diabetes leads to increased susceptibility to tuberculosis through direct effects of hyperglycemia and inadequate secretion of insulin at the cellular level, as well as indirect effects on specialized anti-TB immune cells (macrophages and lymphocytes), where chemotaxis, phagocytosis, activation and antigen presentation by macrophages are impaired (Ogbo et al., 2018). Silva et al., (2018) found that the odds ratio of developing tuberculosis is 2.44 to 8.33 times higher in patients with DM than in those without as active tuberculosis develops most frequently in patients with poor glycemic control.

Malnutrition (both micro- and macro-deficiency) increases the risk of TB because of an impaired immune response which will be unable to fight infection and also stated that TB disease itself can lead to malnourishment because of decreasing appetite and changes in metabolic processes (Lonnroth et al., 2010, Cegielski et al., 2004)
The use of antimicrobials and low adherence and completion of treatments, together with poor TB control programs and lack of access to drugs have been appointed as associated factors in the increase of MDR-TB (Millet et al., 2013). Only one in ten MDR-TB patients receive an appropriate treatment and the poor implementation of efficacious and rapid diagnostic methods for resistance detection hinders the correct treatment of MDR-TB (Creswell et al., 2014).

Lifestyle related factors

The role that cigarette smoke plays in the pathogenesis of tuberculosis is related to ciliary dysfunction, to a reduced immune response, and to defects in the immune response of macrophages, with or without a decrease in the CD4+ count, increasing susceptibility to infection with Mycobacterium tuberculosis (Van et al., 2010). Lin et al., (2007) in their analysis of six studies specifically examining tuberculin reactivity among smokers, that pooled OR for latent TB infection (LTBI) was 2.08 and 1.83 at 5 and 10mm in tuberculin skin tests cutoff points and the effect of smoking on LTBI remained even after adjustment for alcohol.

Alcohol use is another life style factor to TB prevalence. Previous research has shown that approximately 10% of all tuberculosis cases are attributable to alcohol use and also indicated that alcohol abuse influences not only the incidence of tuberculosis but also its clinical evolution and outcome. Silva et al., (2018) .It has conclusively been shown that that the risk of active tuberculosis is substantially elevated among people who drink more than 40 g alcohol per day and/or have an alcohol use disorder and reasons for increased risk include alteration in the immune system, specifically in altering the signaling molecules responsible for cytokine production (Lonnroth et al., 2008). Ogbo et al., (2018) highlighted similar findings that the lifetime prevalence of alcohol use was 57.9%, while the overall prevalence of current alcohol use ranged from 15 to 24% which

Social economic factors

As illustrated in fig 1, socio economic factors are the third most important factors in driving TB prevalence. Socio-economic factors, such as poor living conditions, homelessness, confinement and poverty are at a more risk of developing TB (WHO 2018 Global Tuberculosis Control).

More countries are moving from low income status to developing countries hence growing economy which leads to better lives of people living in those countries. Because of factors such as poverty and political instability in some developing countries people will migrate from low and middle income countries were TB is prevalent to developed countries; thus increasing the risk of TB transmission (Pareek et al., 2016).

A study carried by Hayward et al., (2018) in UK stated that TB cases among the homeless were 20 times higher than the general population at 300 cases per 100,000. In a study of London districts, the TB notification rate increased by 12% for every 1% rise in the number of people living in overcrowded conditions. The difficulties faced during and shortly after migration may increase risk of progression to active disease by compromising immunity, including poor nutrition, concurrent poor health, socioeconomic marginalization, and the stress of relocation (Hayward et al., 2018).

Drug related factors

Drug related factors comes second least after biological related factors and this could be due to the fact that indulging in drugs is a choice. Epidemiological data suggest that the relationship between tuberculosis and illicit drug use is increasing, leading to a public health problem because it involves political, human, social, and economic aspects (Silva et al., 2018). The researcher found that smear positivity at the time of diagnosis of pulmonary tuberculosis was 2.4 times and 1.6 times more likely in patients who were crack cocaine users and in patients who hard drug users were not known to use crack cocaine, respectively, than in their non-drug-using counter parts. Also Millet et al., (2013) described drug use as an important TB risk factor for LTBI and incidence of TB disease.

Biological related factors

Figure 1 present the biological factors as the least of all factors compared to the other existing factors the reason being there are few researches carried out concerning genetic factors. There are several lines of evidence suggesting that host genetic factors may contribute to TB susceptibility and resistance. Abel et al., (2018) demonstrated that monozygotic twins have a higher risk of developing active TB compared with dizygotic twins, and several relevant loci have since been identified using candidate gene studies and genome-wide association studies.

CONCLUSION

Tuberculosis represents a health problem with a very high prevalence and associated deaths worldwide. However, a global decrease in TB has been observed during the last decade as a consequence of hard work in implementing prevention and control campaigns. Despite all this hard work to prevent and treat tuberculosis it still remains an important Public Health problem in both developing countries and developed countries.

Other components to reduce or stop tuberculosis should be addressing factors that predispose a person to develop TB disease. Disease related factors are major predisposing factors for TB prevalence in both developing and developed countries because of HIV prevalence in Africa and high number of people living with diabetes in developed countries. Alcohol and smoking which are life style related factors also contributes to TB prevalence, China and India having the highest percentage of those people. Migration, overcrowding and poverty are recognized risk factors which are confounded with the socioeconomic status of a setting. Rapid migration of people from their country which are less developed to developed increase the chance of transmitting tuberculosis. Drugs and biological related factors are less important predisposing factors because they contribute less to tuberculosis prevalence.

REFERENCES

Abel, L., Fellay, J., Haas, D.W., Schurr, E., Srikrishna, G., Urbanowski, M., Chaturvedi, N., Srinivasan, S., Johnson, D.H. and Bishai, W.R., 2018. Genetics of human susceptibility to active and latent tuberculosis: present knowledge and future perspectives. The Lancet Infectious Diseases, 18(3), pp.e64-e75.

Banerjee, D., Bhattacharyya, R., Kaul, D. and Sharma, P., 2011. Diabetes and tuberculosis: analysis of a paradox. Advances in clinical chemistry, 53, p.139.

Barberis, I., Myles, P., Ault, S.K., Bragazzi, N.L. and Martini, M., 2016. History and evolution of influenza control through vaccination: from the first monovalent vaccine to universal vaccines. Journal of preventive medicine and hygiene, 57(3), p.E115

Davies, P.D., 2003. The world-wide increase in tuberculosis: how demographic changes, HIV infection and increasing numbers in poverty are increasing tuberculosis. Annals of medicine, 35(4), pp.235-243.

Deiss, R.G., Rodwell, T.C. and Garfein, R.S., 2009. Tuberculosis and illicit drug use: review and update. Clinical infectious diseases, 48(1), pp.72-82.

Check, J. and Schutt, R.K., 2011. Research methods in education. Sage Publications
World Health Organization, Global Tuberculosis Report 2018. Geneva:, Contract No: WHO/CDs/TB/2018.20

Gupta, R.K., Brown, A.E., Zenner, D., Rice, B., Yin, Z., Thomas, H.L., Pozniak, A., Abubakar, I., Delpech, V. and Lipman, M., 2015. CD4+ cell count responses to antiretroviral therapy are not impaired in HIV-infected individuals with tuberculosis coinfection. Aids, 29(11), pp.1363-1368
Kivihya-Ndugga, L.E.A., Van Cleeff, M.R.A., Githui, W.A., Nganga, L.W., Kibuga, D.K., Odhiambo, J.A. and Klatser, P.R., 2003.A comprehensive comparison of Ziehl-Neelsen and fluorescence microscopy for the diagnosis of tuberculosis in a resource-poor urban setting. The International Journal of Tuberculosis and Lung Disease, 7(12), pp.1163-1171

Lin, Y., Li, L., Mi, F., Du, J., Dong, Y., Li, Z., Qi, W., Zhao, X., Cui, Y., Hou, F. and Zachariah, R., 2012.Screening patients with diabetes mellitus for tuberculosis in China. Tropical Medicine & International Health, 17(10), pp.1302-1308
Lienhardt, C., Fielding, K., Sillah, J.S., Bah, B., Gustafson, P., Warndorff, D., Palayew, M., Lisse, I., Donkor, S., Diallo, S. and Manneh, K., 2005. Investigation of the risk factors for tuberculosis: a case–control study in three countries in West Africa. International journal of epidemiology, 34(4), pp.914-923

Lönnroth, K., Williams, B.G., Stadlin, S., Jaramillo, E. and Dye, C., 2008. Alcohol use as a risk factor for tuberculosis–a systematic review. BMC public health, 8(1), p.289.

Mack, U., Migliori, G.B., Sester, M., Rieder, H.L., Ehlers, S., Goletti, D., Bossink, A., Magdorf, K., Hölscher, C., Kampmann, B. and Arend, S.M., 2009. LTBI: latent tuberculosis infection or lasting immune responses to M. tuberculosis? A TBNET consensus statement. European Respiratory Journal, 33(5), pp.956-973

Mitku, A.A., Dessie, Z.G., Muluneh, E.K. and Workie, D.L., 2016. Prevalence and associated factors of TB/HIV co-infection among HIV Infected patients in Amhara region, Ethiopia. African health sciences, 16(2), pp.588-595
Narasimhan, P., Wood, J., MacIntyre, C.R. and Mathai, D., 2013. Risk factors for tuberculosis. Pulmonary medicine, 2013

Norbis, L., Alagna, R., Tortoli, E., Codecasa, L.R., Migliori, G.B. and Cirillo, D.M., 2014. Challenges and perspectives in the diagnosis of extrapulmonary tuberculosis. Expert review of anti-infective therapy, 12(5), pp.633-647
Onyebujoh, P.C., Thirumala, A.K. and Piatek, A., 2017. Stronger tuberculosis laboratory networks and services in Africa essential to ending tuberculosis. African journal of laboratory medicine, 6(2), pp.1-7
Pareek, M., Greenaway, C., Noori, T., Munoz, J. and Zenner, D., 2016. The impact of migration on tuberculosis epidemiology and control in high-income countries: a review. BMC medicine, 14(1), p.48.

Piasecki, T.M., Fiore, M.C., McCarthy, D.E. and Baker, T.B., 2002. Have we lost our way? The need for dynamic formulations of smoking relapse proneness. Addiction, 97(9), pp.1093 -1108
Piatek, A.S., Van Cleeff, M., Alexander, H., Coggin, W.L., Rehr, M., Van Kampen, S., Shinnick, T.M. and Mukadi, Y.,2013.GeneXpert for TB diagnosis: planned and purposeful implementation. Global Health: Science and Practice, 1(1), pp.18-23.

Shanmuganathan, R. and Shanmuganathan, I.D., 2015. Clinical manifestation and risk factors of tuberculosis infection in Malaysia: case study of a community clinic. Global journal of health science, 7(4), p.110
Sharma, M.P. and Bhatia, V., 2004.Abdominal tuberculosis. Indian Journal of Medical Research, 120, pp.305-315

Steingart, K.R., Sohn, H., Schiller, I., Kloda, L.A., Boehme, C.C., Pai, M. and Dendukuri, N., 2013.Xpert® MTB/RIF assay for pulmonary tuberculosis and rifampicin resistance in adults. Cochrane database of systematic reviews, (1).

Tang, J.W., Li, Y., Eames, I., Chan, P.K.S. and Ridgway, G.L., 2006. Factors involved in the aerosol transmission of infection and control of ventilation in healthcare premises. Journal of Hospital Infection, 64(2), pp.100-114
WHO Global tuberculosis report 2016. Geneva: WHO; 2016. Available at http://apps.who.int/[accessed 27.10.17].

World Health Organization (2011) Global Tuberculosis Control
World Health Organization [homepage on the Internet]. Geneva: World Health Organization; [cited 2016 Dec 1]. Global Health Risks: Mortality and burden of disease attributable to selected major risks. [Adobe Acrobat document, 70p.]. Available from: http://www.who.int/healthinfo/global_burden_disease/GlobalHealthRisks_report_ full.pdf

World Health Organization, 2004. Interim policy collaborative TB/HIV activities (No.WHO/HTM/TB/2004.330). World Health Organization
Zachariah, R., Spielmann, M.P., Harries, A.D. and Salaniponi, F.M.L., 2002. Moderate to severe malnutrition in patients with tuberculosis is a risk factor associated with early death. Transactions of the Royal Society of Tropical Medicine and Hygiene, 96(3), pp.291- 294.

A SYSTEMATIC REVIEW OF FACTORS INFLUENCING PREVALENCE OF STIs IN SOUTH AMERICA

Author: Keneilwe Mafu

1. Department for Medical Laboratory Science, DDT College of Medicine.

2. Department of Medicine, DDT College of Medicine.

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935

Corresponding Author *Dr Derrick D.Tlhoiwe, Dr Tumelo Tlhoiwe, Larry.L. Mweetwa*
Email: *journals@ddtcollegeofmedicine.com*

Abstract

Sexually transmitted infections are among the most common acute conditions in the world. There are over 30 infections that can be transmitted sexually but this research will only focus on four sexually transmitted diseases namely; chlamydia, HIV, gonorrhea and syphilis (WHO 2016). Sexually transmitted disease add a significant disease burden to the disease burden of the world in general and South America in particular. The major factors that influence the prevalence of STIs were identified to be high risk behavior and socioeconomic status. These factors lead to high prevalence rates of STIs because they facilitate the spread and transmission of STIs. Low prevalence rates were associated with condom use, better healthcare and the availability of HIV/STI testing centers.

Keywords: Sexual Transmitted infections, Prevalence, HIV, Syphillis.

Background

Sexually transmitted infections affect all population groups, regardless of gender and age although they are more prevalent in certain population groups than others (WHO 2013).These infections when diagnosed early, except for HIV, they are curable. Today, even HIV, can be slowed down by the use of antiretroviral therapy, once diagnosed. With delayed diagnosis or no treatment, STIs can cause preventable complications (Aral et al., 2007). Up-to-date information on factors influencing the prevalence of STIs under study across the different population groups through a systematic review of literature was undertaken.

Transmission and causes of the STIs

Chlamydia is a common bacterial infection caused by obligate intracellular Gram negative bacteria, Chlamydia trachomatis, it is transmitted through unprotected sexual contact

either vaginally, anally or orally with another person who has Chlamydia (Rowley J et al., 2016).

Gonorrhea is a sexually transmitted infection (STIs) caused by oxidase positive intracellular gram negative diplococcic bacteria, Neisseria gonorrhea or gonococcus which is common among people of ages between 14 and 24 years (Gottlieb et al., 2014). Syphilis is a really common STI spread through vaginal, anal, and oral sex. Syphilis is caused by motile spirochetes Treponema palladium which is isolated from the serous fluids from lesions. The sores are usually painless, but they can easily spread the infection to other people (Newman L 2012). Human Immunodeficiency Virus (HIV) is an infection caused by an enveloped virus of retroviridae family that attacks and destroys the CD4 cells thus weakening the immune system (Horton R 2010). The virus is transmitted through unprotected sex either vaginally, anally or orally, transfusion of infected blood and blood components, from infected mother to the child either through breastfeeding or during pregnancy or birth, sharing of needles with the infected individuals (Cheesebrough 2006).

Complications caused by the STIS

Gonorrhea, syphilis and chlamydia may cause acute conditions such as cervicitis, urethritis and genital ulcerations which can also lead to severe complications that tend to affect patients or different individuals in the long term sequelae. These complications may include pelvic inflammatory disease, ectopic pregnancy, infertility, chronic pelvic pain and cardiovascular disease in adults, premature delivery, blindness or severe disability in infants and increased risk of HIV acquisition and transmission (Rowley J et al., 2016). Sexually transmitted diseases can also impact those who are affected socially as they frequently result in stigma, stereotyping, vulnerability and shame they have also been associated with gender based violence.

STIs are among the well most established risk factors for HIV infection. STIs facilitate HIV transmission by breaching protective mucosal barriers and recruiting susceptible immune cells e.g. CD4 T helper cells and macrophages to the site of infection (Berman et al., 2007)

Ulcerative and non-ulcerative STIs also create portals of entry for HIV to access susceptible cells. STIs can also cause bleeding and thus further increasing the risk for exposure to HIV during sexual activity (Sexton J 2005). The effects of HIV infection on immunity can increase susceptibility to other STIs as individuals who are immune compromised are less able to mount a protective response against sexually transmitted pathogens (Myer L 2006).

Sexually transmitted co-infections pose considerate health threats to people living with HIV/AIDS. Syphilis is related to both increased concentrations of HIV RNA in blood plasma and decrease CD4 cells (Horton R et al., 2012). Viral STIs and genital ulcer diseases are also linked to increased concentrations of HIV in blood plasma and genital fluids. In addition STIs appear to have a bidirectional pathogenic relationship with HIV (Holmes K 2010). HIV can accelerate disease progression of other viral infections when individuals are immune compromised.

Co-occurring STIs are more difficult to treat and symptomatic periods may linger.

The South American region is not immune to the effects of STIs hence the need to determine up-to-date prevalence rates to help direct health service delivery and interventions to the most deserving population groups (s) in a timely manner.

RESEARCH AIM

The aim of this study is to conduct a systematic review of factors influencing the prevalence of STIs.

OBJECTIVE

1. To identify factors that influence the spread of STIs
2. To evaluate the factors that influence the spread of STIs

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 4 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 26 studies identified, 5 were excluded due to year of publication. Out of the 21 selected, 16 were further excluded due to unsatisfactory results and conclusion. Only 5 were finally used

Fig 1.0 | Prisma Flow Chart

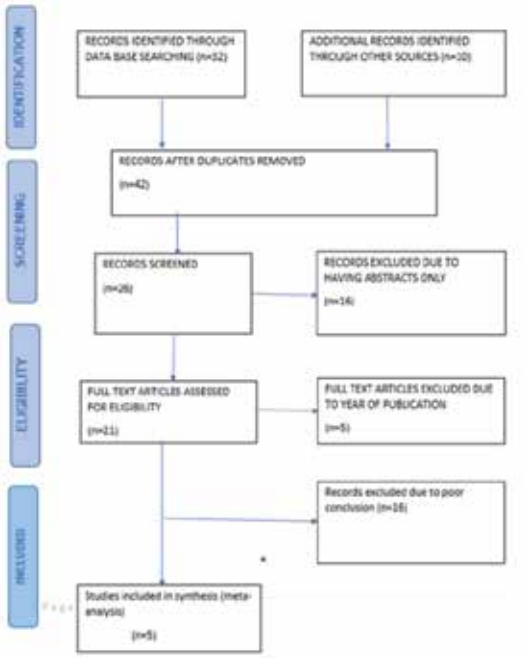
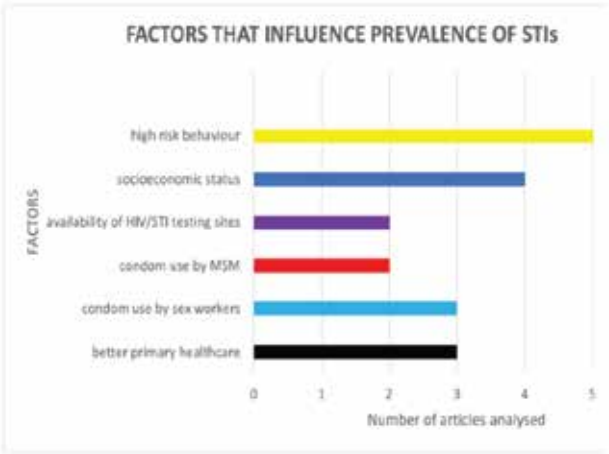


Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

High risk behaviour

Engaging in high risk behaviour was found to be the leading factor that affects prevalence of STIs in South America. High risky behaviours include having unprotected sex, unprotected mouth to genital contact (oral sex) and anal sex, these behaviours facilitate the spread and transmission of STIs (Morales et al., 2008

Socioeconomic status

Socioeconomic status contribute to the likelihood of contracting an STI. Socioeconomic problems include poverty, lack of education and social inequity. These problems lead to high prevalence rates of STIs (Nunes et al., 2007). Thesis reviews found prevalence rates of chlamydia were greater than syphilis and gonorrhoea. The chlamydia rates were reported to be 41.5% in adolescents aged 14-19. Chlamydial infections have high asymptomatic rates in women and men making clinical diagnosis difficult. Diagnostic methods are costly and South American countries cannot afford these diagnostic tools due to the low socioeconomic status of the countries. The unavailability of sensitive diagnostic tests accounts for the high prevalence rates of chlamydia.

Availability of HIV/STI testing centres

The 2015 global estimates of STI reported low prevalence rates of STI. Syphilis rates ranged from 0.2% to 1.8% in different regions of South America while gonorrhoea rates ranged from 0.1% to 1.3%. Access to Syphilis antenatal screening contributed to syphilis prevalence. The availability of HIV/STI testing centres help to curb the spread of STIs by providing timely diagnosis and treatment.

Condom use by MSM

Condom use was linked with low prevalence rates because it lowers the risk of getting infected with an STI. A study by Baral S (2007) found the sero-incidence of HIV infection per 100 person years by LS-EIA assay for 975 MSM was 5.1% and it ranged from 2.1% in Guatemala to 2.7% in Panama, 3.6% in El Salvador, 4.9% in Honduras, and 14.4% in Nicaragua (WHO 2010).

Condom use by sex workers

FSW had low HIV seroincidence which ranged from 0% in panama, 1.8% in El Salvador, 3.2% in Nicaragua and 3.2% in Honduras. Factors that led to this findings were correct knowledge on HIV prevention methods in FSW, consistent condom use with new and regular clients and FSW having access to condoms in their workplaces e.g. in brothels. The use of condoms help to reduce the risk of getting an STI. When used consistently and correctly condoms are highly effective in preventing STIs (Ambrosioni et al., 2011).

Better primary healthcare

Better primary health lead to reduced rates of STIs. With better healthcare STIs are easily controllable. Primary healthcare helps to provide early diagnosis and timely commencement of treatment and this in turn prevents complications.

CONCLUSION

The major factors that influence the prevalence of STIs were identified to be high risk behavior and socioeconomic status. These factors lead to high prevalence rates of STIs because they facilitate the spread and transmission of STIs. This findings highlight the urgent need for the public health community to ensure that well-recognized effective interventions for STI prevention, screening, diagnosis, and treatment are made more widely available. Improved estimation methods are needed to allow use of more varied data and generation of estimates at the national level.

Low prevalence rates were associated with condom use, better healthcare and the availability of HIV/STI testing centers. This shows that these factors are effective in curbing the spread and transmission of STI.

REFERENCES

Ambrosioni J, Calmy A, Hirschel B. (2011) HIV treatment for prevention. J Int AIDS Soc, 14:28.

Baral S, Sifakis F, Cleghorn F, Beyrer C. Elevated risk for HIV infection among men who have sex with men in low- and middle-income countries 2000-2006: A systematic review. PLoS Med 2007;4:e339.

Berman, S., and M. Kamb, 2007, Biomedical Interventions, in SO Aral, JM Douglas, and JA Lipshutzeds., Behavioral Interventions for Prevention and Control of Sexually Transmitted Diseases: Springer Science and Business Media, LLC, p. 60-101.

Gottlieb SL, Low N, Newman LM, Bolan G, Kamb M, Broutet N. Toward global prevention of sexually transmitted infections (STIs). 2014; 32:1527–35. doi:10.1016/j.vaccine.2013.07.087.

Holmes K. Sexually transmitted diseases. 4th ed. New York: McGraw Hill; 2008. Fox J, Fidler S. Sexual transmission of HIV-1. Antiviral Res. Jan; 2010 85(1):276–85. [PubMed:19874852] A comprehensive recent review of determinants of sexual transmission of HIV.

Horton R. Global Burden of Disease 2010: understanding disease, injury, and risk. Lancet. 2012; 380(9859): 2053–2054. doi: 10.1016/S0140-6736(12)62133-3 PMID: 23245595.

Monica Cheesebrough (2006).DISTRICT LABORATORY PRACTICE IN TROPICAL COUNTRIES, second edition. Cambridge University Press, New York.

Morales-Miranda S, Paz-Bailey G, Arambu N, Álvarez B, Paredes M, Monterroso E. [Central American Survey of Sexual Behavior and HIV/STI Prevalence among Vulnerable Populations in Honduras (ECVC): Men Who Have Sex with Men. Final report. Tegucigalpa: Del Valle University of Guatemala, Honduran Ministry of Health, CDC, USAID, TechNet, Inc, 2008.

Myer L, Denny L, de Souza M, Wright TC Jr, Kuhn L. Distinguishing the temporal association between women's intravaginal practices and risk of human immunodeficiency virus infection: a prospective study of South African women. Am J Epidemiol. 2006;163(6):552–60. pmid:16443804.

Newman L, Rowley J, Hoorn SV, Wijesooriya NS, Unemo M, Low N, Stevens G, Gottlieb S, Kiarie J, Temmerman M. Global estimates of the prevalence and incidence of four curable sexually transmitted infections in 2012 based on systematic review and global reporting. PLoS ONE 2015; 10(12):e0143304.

Nunes CL, Andrade T, Galvão-Castro B, Bastos FI, Reingold A: Assessing risk behaviors and prevalence of sexually transmitted and blood-borne infections--. Braz J Infect Dis. 2007, 11: 561.

Rowley J, Vander Hoorn S, Korenromp E, Low N, Unemo M, Abu-Raddad LJ, et al. Global and regional estimates of the prevalence and incidence of four curable sexually transmitted infections in 2016. Bull World Health Organ (in press).

Sexton J, Garnett G, Rottingen JA. Metaanalysis and metaregression in interpreting study variability in the impact of sexually transmitted diseases on susceptibility to HIV infection. Sexually Transmitted Diseases. 2005; 32(6):351–7. [PubMed: 15912081]

World Health Organization, Department of HIV/AIDS Global Prevalence and Incidence of Selected Curable Sexually Transmitted Infections: Overview and Estimates. Geneva, Switzerland: World Health Organization, 2010. WHO reference number: WHO/HIV_AIDS/2010.02 and WHO/CDS/CSR/EDC

World Health Organisation. Report on global sexually transmitted infection surveillance 2013. Geneva: WHO; 2014.

World Health Organization. Global health sector strategy on sexually transmitted infections 2016–2021: towards ending STIs. Geneva: World Health Organization; 2016 Jul [cited 2017 Aug 3]. Available from: http://apps.who.int/iris/bitstream/10665/246296/1/WHO-RHR16.09-eng.pdf?ua=1.

A SYSTEMATIC REVIEW OF FACTORS INFLUENCING PREVALENCE OF IRON DEFICIENCY ANEMIA IN THE ELDERLY IN WEST AFRICA

Author: Mbaki Mathumo

1. Department for Medical Laboratory Science, DDT College of Medicine.

2. Department of Medicine, DDT College of Medicine.

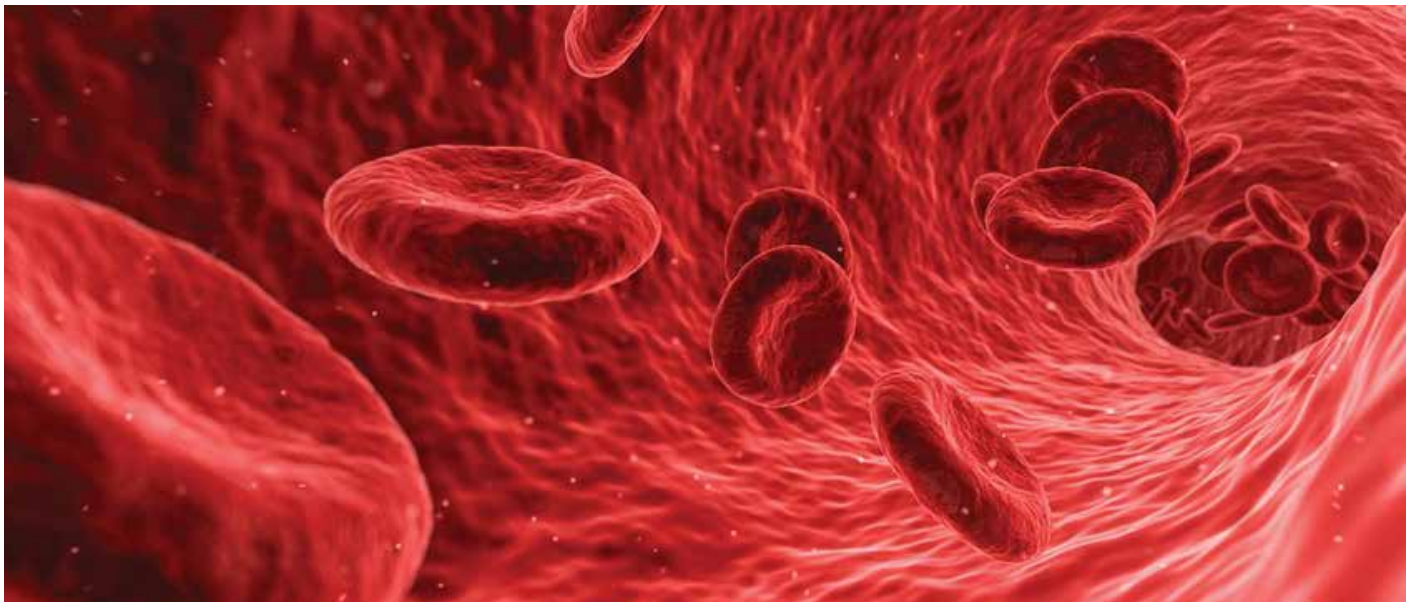
Corresponding Author *Dr Derrick D.Tlhoiwe, Dr Tumelo Tlhoiwe, Larry.L. Mweetwa*
Email: *journals@ddtcollegeofmedicine.com*

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935

Abstract

Iron deficiency is highly prevalent in most developing countries. Its detection is often obscured by infections and inflammatory disorders that are common in the same populations. The prevalence of iron deficiency anaemia increases with age. According to data from the World Health Organization (WHO), anaemia is defined as haemoglobin (Hb) value under 12 g/dL in women and 13 g/dL in men. In community-dwelling elderly individuals, anaemia increases fatigue, dementia, falls ,decreases mobility and life quality, while in hospitalized elderly patients it increases the incidence of delirium and thereby morbidity; in both the community dwelling elderly and those residing in nursing homes, iron deficiency anaemia results in higher mortality rates by exacerbating existing diseases such as heart and kidney failure.

Key words | Anemia,Iron deficiency



Background

Anaemia is a global public health problem affecting both developing and developed countries with major consequences for human health as well as social and economic development. It occurs at all stages of the life cycle, but is more prevalent in pregnant women and young children. In 2002, iron deficiency anaemia (IDA) was considered to be among the most important contributing factors to the global burden of disease (WHO.,2005).

Aetiology of iron deficiency anaemia

Anaemia is a decrease in red blood mass or haemoglobin (Hb), leading to decreased ability to carry oxygen to the tissues. The World health Organization (WHO) recommendation, defines anaemia as Hb level < 12.0 g/dL for women and <13.0 g/L for men however the appropriateness for the elderly has yet to be established (WHO., 2004). Anaemia develops gradually and does not have clinically apparent symptoms until anaemia becomes severe. Anaemia can be classified into several categories depending on the cause of the decrease in haemoglobin. The occurrence of anaemia is due to the various red cell defects such as production defect (aplastic anaemia), maturation defect (megaloblastic anaemia), defects in haemoglobin synthesis (iron deficiency anaemia), genetic defects of haemoglobin maturation (thalassemia) or due to the synthesis of abnormal haemoglobin (haemoglobinopathies, sickle cell anaemia and thalassemia) and physical loss of red cells (haemolytic anaemia's) Ghosh et al., 2012).

The aetiology of iron deficiency anaemia during puberty might be due to increased iron demand/loss or decreased iron intake, chronic blood loss, iron malabsorption (celiac disease), pregnancy, or parasitic infection (helminthiasis), (Al-Alimi et al., 2018). Iron deficiency anaemia is a common nutritional deficiency disorder and global public health problem which affects both developing and developed countries with major consequences on human health and social and economic development (WHO., 2005). According to WHO (2004) reports, one third of the global populations (over 2 billion) are anaemic due to imbalance in their nutritious food intake. Iron deficiency occurs when an insufficient amount of iron is absorbed to meet the body's requirements. This insufficiency may be due to inadequate iron intake, to reduced bioavailability of dietary iron, to increased needs for iron, or to chronic blood loss. Iron deficiency is by far the commonest nutritional cause of anaemia; it may be associated with a folate deficiency, especially during pregnancy (Ezzati et al., 2002).

World Health Organisation estimates that among the South Asian countries, India has the highest prevalence of anaemia. More importantly about half of the global maternal deaths due to anaemia occur in South Asian countries and India contributes to about 80 per cent of the maternal deaths. (Ezzati et al., 2002). Iron deficiency anaemia is a serious public health problem given its impact on psychological and physical development, behaviour, and work performance (Ezzati et al., 2002). It is the most prevalent nutritional problem in the world today despite affecting more than 700 million persons.

Other nutrient deficiencies such as vitamin B, pyridoxine and copper are of little public health significance because of their infrequency. Infants, preschool children, adolescents and women of childbearing age, particularly pregnant women, are at greatest risk of developing iron deficiency anaemia. However, adult males may also be at risk, especially where there is inadequate food intake or frequent parasitic infestation (DeMaeyer., 1985).Poor iron supply for erythropoiesis results in microcytic red blood cells that contain depleted amounts of haemoglobin (Hussain., 2015).

Iron deficiency can be defined as the reduction of iron stores that precedes overt iron deficiency anaemia or persists without progression (McKenzie., 2015). Iron deficiency manifests in three stages, iron depletion, iron-deficiency erythropoiesis and the last stage of iron deficiency anaemia which can be explained as a long-standing negative iron flow in the body (McKenzie., 2015).Iron deficiency anaemia (IDA) has also been shown to produce oxidative stress on cells that results in production of a substance called malondialdehyde (Selvaraj et al., 2008). Clinically, IDA patients may present with pica which is an unusual craving for eating unnatural substances such as soil (geophagia), ice (phagophagia) and starch eating (amylophagia) (McKenzie., 2015).

TOther presentations may include koilonychias (spoon shaped nails), poor muscle function, erectile dysfunction in males and inability to regulate body temperature when stressed or cold (McKenzie., 2015).

Iron metabolism is controlled by absorption rather than excretion (McKenzie., 2015). Iron absorption is only 5 to 10 percent of dietary intake. Absorption can increase three to fivefold in states of depletion (McKenzie., 2015). Dietary iron is available in two forms: heme iron (found in meat and minimally affected by dietary factors) and non-heme iron (found in plant foods) (McKenzie., 2015).

Dietary iron bioavailability is low in populations consuming monotonous plant-based diets (Hurrel., 2007). The high prevalence of iron deficiency in the developing world has substantial health and economic costs, including poor pregnancy outcome, impaired school performance, and decreased productivity. Recent studies have reported how the body regulates iron absorption and metabolism in response to changing iron status by up regulation or down regulation of key intestinal and hepatic proteins. Targeted iron supplementation, iron fortification of foods, or both, can control iron deficiency in populations. (Zimmermann., 2007).

Although technical challenges limit the amount of bioavailable iron compounds that can be used in food fortification, studies show that iron fortification can be an effective strategy against nutritional iron deficiency. Specific laboratory measures of iron status should be used to assess the need for fortification and to monitor these interventions. Selective plant breeding and genetic engineering are promising new approaches to improve dietary iron nutritional quality (Zimmermann., 2007).

The prevalence of iron deficiency anaemia increases with age. According to data from the World Health Organization (WHO), anaemia is defined as haemoglobin (Hb) value under 12 g/dL in women and 13 g/dL in men. In community-dwelling elderly individuals, anaemia increases fatigue, dementia and falls and decreases mobility and life quality, while in hospitalized elderly patients it increases the incidence of delirium and thereby morbidity; in both the community dwelling elderly and those residing in nursing homes, iron deficiency anaemia results in higher mortality rates by exacerbating existing diseases such as heart and kidney failure (Sahin., 2015).The reported prevalence of iron deficiency anaemia among the elderly varies between 2.9 and 61 % depending on the study population(Sahin .,2015).
Older patients with IDA are often asymptomatic and the diagnosis is made during a routine blood analysis. Symptoms and signs can be a specific as a result of anaemia, such as fatigue, paleness, dyspnea, angina pectoris and edema, or more specifically related to IDA, such as koilonychia, pica and atrophic glossitis(Joosten., 2017).

There is also some evidence that IDA is associated with restless legs syndrome in geriatric patients. Chronic blood losses, such as haematuria, and haemorrhoidal and gynaecological blood loss, are mostly obvious causes associated with IDA. In specific cases, the combination of symptoms and clinical signs, such as melena and abdominal pain or malabsorption and diarrhoea, are suggestive for a specific underlying cause, such as colonic cancer or celiac disease, respectively(Joosten., 2017).

RESEARCH AIM

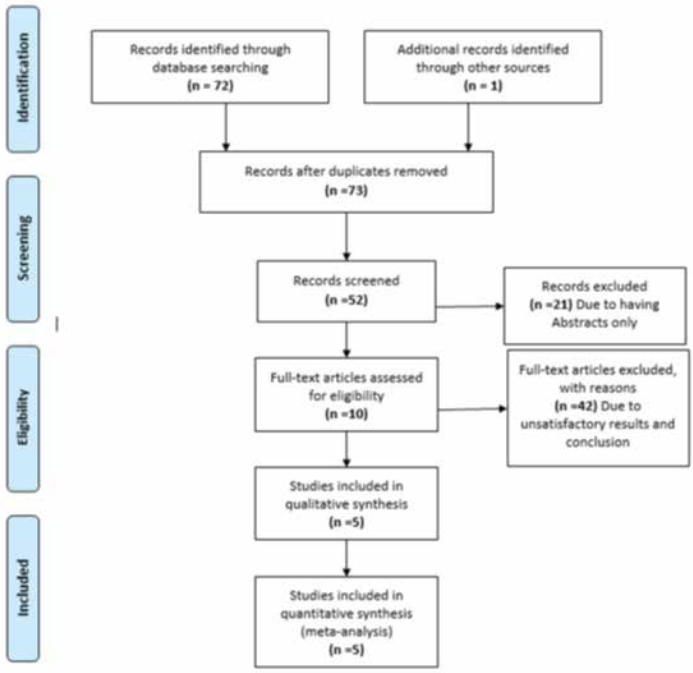
The aim of this research was to assess and analyse the prevalence of iron deficiency anaemia in the elderly in West Africa.

OBJECTIVE

1. To identify factors responsible for the prevalence of iron deficiency anaemia in the elderly.
2. To evaluate factors responsible for the prevalence of iron deficiency anaemia in the elderly.

RESULTS

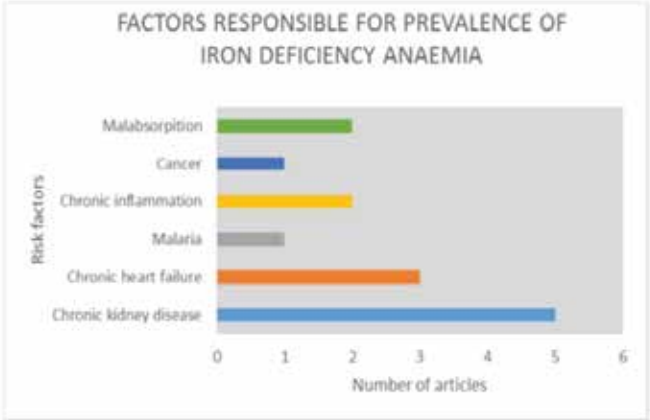
Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 4 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 73 studies identified, 21 were excluded due to having abstract only. Out of the 52 selected, 42 were further excluded due to unsatisfactory results and conclusion. Only 5 were finally used



METHODOLOGY

In order to answer the aims and objectives of this research, due to constraint of time and limited financial resources, a systematic review approach was adopted, this methodology fitted in well in our research design. Data was collected from academically reputable data bases and studies were selected using the PRISMA tool approach for inclusion and exclusion. Five articles were selected in the final analysis of the findings.

KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

Malabsorption

Iron is very important in maintaining many body functions, including the production of haemoglobin, the molecule in your blood that carries oxygen. Iron is also necessary to maintain healthy cells, skin, hair, and nails. Iron from the food you eat is absorbed into the body by the cells that line the gastrointestinal tract; the body only absorbs a small fraction of the iron you ingest. (Saboor et al.,2015). The iron is then released into the blood stream, where a protein called transferrin attaches to it and delivers the iron to the liver. Iron is stored in the liver as ferritin and released as needed to make new red blood cells in the bone marrow. (Saboor et al.,2015).

When red blood cells are no longer able to function (after about 120 days in circulation), they are re-absorbed by the spleen. Iron from these old cells can also be recycled by the body. H. pylori infection like other malabsorption diseases may also cause IDA (Saboor et al.,2015)..H. Pylori usually cause gastric ulcer or gastric malignancy. Studies have shown that it may cause extra gastric disease such as H. pylori associated anaemia. Mechanism of H. pylori associated anaemia is unknown. H. pylori associated iron deficiency anaemia is mainly present in those individual who have increased demand for iron as in children and in pregnant, postpartum and premenopausal women (Saboor et al.,2015). Malabsorption of iron is an uncommon cause of iron deficiency anaemia. Most of the cases are secondary to some underline pathological process in the gastrointestinal tract.

However cases of primary malabsorption of iron do exist although their incidence is rather small (Saboor

et al., 2015). Dufour et al first reported that H. pylori eradication had a positive effect on sideropenic refractory anaemia, indicating a possible underlying association between H. pylori and IDA. A large population-based study from the USA reported that H. pylori infection was an independent risk factor for IDA in adults. This research reported that H. pylori infection was associated with an increased risk of IDA.

Cancer

All cancer types are associated with an increased risk of developing iron deficiency anaemia, though the risk is higher with certain types of cancer. And the consequences of iron deficiency anaemia can be particularly severe in people with cancer, potentially interfering with treatment and lowering the odds of survival (Phillips.,2017). In a study published in July 2013 in the Annals of Oncology, iron deficiency was most commonly seen in people with pancreatic cancer (present in 63 percent of participants), followed by colorectal cancer (52 percent) and lung cancer (51 percent). In forms of cancer with solid tumours, later stages of the cancer were associated with a higher risk of iron deficiency. For blood cancers, the prevalence of iron deficiency was similar across all cancer stages (Phillips.,2017). In a study published in 2015 in the journal Blood, 75 percent of people on chemotherapy for various cancer types were found to be iron deficient, with 60 percent showing signs of absolute iron deficiency. The researchers noted that chemotherapy can cause iron deficiency due to a reduced appetite and poor nutrition, gastrointestinal mucosal damage that results in blood loss, or the release of chemicals known as cytokines.

Chronic inflammation

It is characterized by hypoferremia due to iron sequestration that eventually results in iron-restricted erythropoiesis. During the last decade, the molecular mechanisms of iron sequestration have been found to centre on cytokine-stimulated overproduction of the iron-regulatory hormone hepcidin. The inflammatory cytokine interleukin-6 (IL-6) is a particularly prominent inducer of hepcidin, but other cytokines are likely to contribute as well (Goodnough.,2014). Hepcidin excess causes the endocytosis and proteolysis of the sole known cellular iron exporter, ferroportin, trapping iron in macrophages and iron-absorbing enterocytes. The supply of iron to haemoglobin synthesis becomes limiting, eventually resulting in anaemia. Depending on the details of the underlying disease, other inflammation-related mechanisms may also contribute to anaemia (Goodnough .,2014.The prevalence of inflammation or infection, which was indicated by elevated CRP concentrations, was high in all the population groups, especially in the women (12%) and men (16%). CRP was positively correlated with the malaria parasite load in men (Asobayire et al., 2001).

The effects of chronic inflammation on intestinal absorption are just beginning to unfold. Another acute phase response includes an increase in hepcidin production by the liver, subsequently reducing the intestinal absorption of iron.Hepcidin is a small circulating antimicrobial peptide synthesized by the liver that regulates iron absorption (Clark.,2008). The overproduction of hepcidin prevents mobilization of iron and contributes to the pathophysiology of anaemia. All of these factors collectively or individually can alter iron status and mediate the development of anaemia (Clark.,2008). Inflammatory bowel disease (IBD): Iron deficiency anaemia in IBD occurs due to chronic blood loss from GIT and poor absorption through the small intestinal mucosa. IBD includes Crohn's disease and ulcerative colitis. Prevalence of iron deficiency anaemia in IBD is about 63%. Diagnosis of IBD is based on a combination of clinical, endoscopic and histological features (Saboor et al.,2015).

Malaria

Traditionally, the prevalence of anaemia was used to estimate the prevalence of iron deficiency and IDA. However, in many developing countries, anaemia can also result from infections such as malaria. The prevalence of malaria infection was very high in women (19%) and the men (17%). (Asobayire et al.,2001). In malaria-endemic countries, malaria is a major contributor to anaemia at the population level, the authors estimated that in sub-Saharan African, 24.7% of anaemia is attributable to malaria (Kassebaum et al., 2014). The relationship between malaria control and anaemia risk may be partially dependent on hepcidin and its effects on iron absorption and utilization (as well as by reducing the well-known inhibitory effects of malaria on erythropoiesis). The hepcidin increases associated with malaria infection prevent efficient iron uptake. Iron supplementation has been shown to be less effective in areas with high malaria transmission (Geraet et al., 2007).

Chronic heart failure

Seminal studies on iron supplementation in CHF patients, most of them being elderly, used a broad definition of IDA, that is, ferritin levels <100mg/L, or up to 300mg/L if concomitant transferrin saturation was <20%.While the main goal was to correct tissue IDA (cardiac and muscular, not necessarily the anaemia), a sub analysis on patients who were anaemic at baseline showed significant amelioration of anaemia after intravenous iron (Girelli.,2008). Patient, suffering from
CHF among the other comorbidities, there is sufficient evidence that IDA correction could actually improve the overall prognosis .During adulthood, some of the increase can likewise be attributed to population growth, while a portion may also be the result of enhanced survival among those with chronic conditions known to cause anaemia (Kassebaum.,2013) .The main causes for IDA in older patients are chronic blood loss and iron malabsorption .

(Joosten .,2017). Gastrointestinal bleeding is the predominant cause to explain IDA (Joosten., 2017).If absolute iron deficiency is diagnosed, in the elderly postmenopausal population it is mandatory to rule out gastrointestinal (GI) pathology, including malignancy as a source of chronic blood loss (Goodnough.,2014). When serum ferritin and transferrin saturation values are inconclusive, further evaluation is necessary to rule out absolute iron deficiency (Goodnough., 2014)

Chronic kidney disease

Anaemia is a common comorbidity of CKD and is often ignored or left untreated. It is estimated that more than 40% of CKD patients are anaemic, yet more than likely, it is much higher, especially in the elderly population, in part because of age-associated renal impairment(Clark.,2008). Anaemia from CKD increased with age in an accelerating fashion for both sexes, culminating as the most prevalent cause of anaemia in the 80+ year's age group(Kassebaum.,2013) Overall, these studies strongly suggest that ferritin thresholds for IDA in people aged >65 years should be reconsidered. In our opinion, it could be reasonable to consider a threshold of at least 45mg/L, if not 100mg/L, particularly when certain comorbidities occur, such as stage 3 to 5 CKD or CHF (Girelli.,2008). Serum creatinine and GFR must be determined in order to evaluate for CKD (Goodnough., 2014). The incidence of anaemia in individuals living in skilled nursing homes has been reported to be 48% and is also often left untreated. A deficiency of erythropoietin production and iron deficiency are considered the primary factors contributing to anaemia in CKD.The diseased kidney loses some functional capacity related to iron metabolism (Clark.,2008). Causative factors include impaired intestinal absorption of iron with uraemia, limited production of erythropoietin essential to make haemoglobin, and shortened erythrocyte survival (Clark.,2008). The evaluation of anaemia must also consider unexpected diagnoses including CKD (Goodnough., 2014).

CONCLUSION

Out of the 5 articles, chronic kidney disease and chronic heart failure factors were the most common risk factors influencing prevalence of iron deficiency anaemia in West Africa, followed by chronic inflammation, malabsorption, cancer and malaria.
In conclusion, IDA is highly prevalent and considered as serious health problems among the elderly, in West Africa. My findings showed that more cases of IDA were caused by chronic kidney diseases. Most of cases IDA were occurring due to chronic kidney disease, chronic inflammation, chronic heart failure, malaria, cancer and malabsorption all of those were identified as the significant risk factors increasing the prevalence of IDA among the elderly. To prevent the prevalence of IDA among the elderly, a proper health education to increase knowledge about anaemia and its causative factors, benefits of taking iron-rich food, and avoiding unhealthy food and drink intake is needed.

REFERENCES

Abelev, B., Adam, J., Adamova, D., Adare, A.M., Aggarwal, M., Rinella, G.A., Agnello, M., Agocs, A.G., Agostinelli, A., Ahammed, Z. and Ahmad, N., 2013. Long-range angular correlations on the near and away side in p–Pb collisions at sNN= 5.02 TeV. Physics Letters B, 719(1-3), pp.29-41.

Abernathy, C.O., Liu, Y.P., Longfellow, D., Aposhian, H.V., Beck, B., Fowler, B., Goyer, R., Menzer, R., Rossman, T., Thompson, C. and Waalkes, M., 1999. Arsenic: health effects, mechanisms of actions, and research issues. Environmental health perspectives, 107(7), pp.593-597.

Afr Health Sci. 2017 Jun; 17(2): 575–583. Doi: 10.4314/ahs.v17i2.35
Al-alimi, A.A., Bashanfer, S. and Morish, M.A., 2018. Prevalence of Iron Deficiency Anemia among University Students in Hodeida Province, Yemen. Anemia, 2018.

Alsace, R., 2017. Ademe, 2015. Consommations, besoins et richesses du territoire alsacien,[En ligne] URL: https://alsace. ademe. fr/sites/default/files/-files/Domaines-intervention/Economie-circulaire/synthese_etude_de_flux_juillet2015. pdf, Consulté le, 31.

Alzaheb, R.A. and Al-Amer, O., 2017. The prevalence of iron deficiency anaemia and its associated risk factors among a sample of female university students in Tabuk, Saudi Arabia. Clinical Medicine Insights: Women's Health, 10, p.1179562X17745088.

Animasahun, V. J., & Chapman, H. J. (2017). Psychosocial health challenges of the elderly in Nigeria: a narrative review. African Health Sciences, 17(2), 575. doi:10.4314/ahs.v17i2.35
Asobayire, F.S., Adou, P., Davidsson, L., Cook, J.D. and Hurrell, R.F., 2001. Prevalence of iron deficiency with and without concurrent anemia in population groups with high prevalences of malaria and other infections: a study in Cote d'Ivoire. The American Journal of Clinical Nutrition, 74(6), pp.776-782.

Behrman, J.R. and Deolalikar, A.B., 1988. Health and nutrition. Handbook of development economics, 1, pp.631-711.
Carnicer, J., Badia, R. and Argemi, J., 1997. Helicobacter pylori gastritis and sideropenic refractory anaemia. Journal of paediatric gastroenterology and nutrition, 25(4), p.441.

Check, J. and Schutt, R.K., 2011. Research methods in education. Sage Publications.
Creswell, J.W. and Clark, V.L.P., 2017. Designing and conducting mixed methods research. Sage publications.

DeMaeyer, E.M. and Adiels-Tegman, M., 1985. The prevalence of anaemia in the world.
Eberl, G., Colonna, M., Di Santo, J.P. and McKenzie, A.N., 2015. Innate lymphoid cells: A new paradigm in immunology. Science, 348(6237), p.aaa6566.

Egbewale, B.E., Akindele, A.A., Adedokun, S.A. and Oyekale, O.A., 2018. Prevalence of asymptomatic malaria and anaemia among elderly population in Osun state Southwestern, Nigeria. International Journal of Community Medicine and Public Health, 5(7), pp.2650-2656.

Ezzati, M, Lopus, A.D., Dogers, A., Vander, H.S., Murray C., 2002. Selected major risk factors and global and regional burden of disease. Lancet 360: 1347-60
Fitzmaurice, C., Dicker, D., Pain, A., Hamavid, H., Moradi-Lakeh, M., MacIntyre, M.F., Allen, C., Hansen, G., Woodbrook, R., Wolfe, C. and Hamadeh, R.R., 2015. The global burden of cancer 2013. JAMA oncology, 1(4), pp.505-527.

Flick, U. ed., 2013. The SAGE handbook of qualitative data analysis. Sage.
Galliers, R.D., 1991. Strategic information systems planning: myths, reality and guidelines for successful implementation. European Journal of Information Systems, 1(1), pp.55-64.

Ganz, T., Olbina, G., Girelli, D., Nemeth, E. and Westerman, M., 2008. Immunoassay for human serum hepcidin. Blood, 112(10), pp.4292-4297.

Gaskell, H., Derry, S., Andrew Moore, R., & McQuay, H. J. (2008). Prevalence of anaemia in older persons: systematic review. BMC Geriatrics, 8(1). doi: 10.1186/1471-2318-8-1
Gebreyes, Y.F., Goshu, D.Y., Geletew, T.K., Argefa, T.G., Zemedu, T.G., Lemu, K.A., Waka, F.C., Mengesha, A.B., Degefu, F.S., Deghebo, A.D. and Wubie, H.T., 2018. Prevalence of high blood pressure, hyperglycaemia, dyslipidaemia, metabolic syndrome and their determinants in Ethiopia: Evidences from the National NCDs STEPS Survey, 2015. PloS one, 13(5), p.e0194819.

Goodnough, L.T. and Schrier, S.L., 2014. Evaluation and management of anaemia in the elderly. American journal of haematology, 89(1), pp.88-96.
Hussain N (2015). Haemoglobin A1C and Iron Deficiency Anaemia our Understanding through the Decades. Roma Journ Diab Nutri & Met Dis22:289-296.

Joosten, E., Pelemans, W., Hiele, M., Noyen, J., Verhaeghe, R. and Boogaerts, M.A., 1992. Prevalence and causes of anaemia in a geriatric hospitalized population. Gerontology, 38(1-2), pp.111-117.

Kassebaum, N. J., Jasrasaria, R., Naghavi, M., Wulf, S. K., Johns, N., Lozano, R., Murray, C. J. L. (2013). A systematic analysis of global anaemia burden from 1990 to 2010. Blood, 123(5), 615–624. doi: 10.1182/blood-2013-06-508325
Keshavarzi, S., Ahmadi, S.M. and Lankarani, K.B., 2015. The impact of depression and malnutrition on health-related quality of life among the elderly Iranians. Global journal of health science, 7(3), p.161.

Kohlbacher, F., 2006. The use of qualitative content analysis in case study research. In Forum Qualitative Sozialforschung/Forum: Qualitative Social Research (Vol. 7, No. 1, pp. 1-30). Institut für Qualitative Forschung.

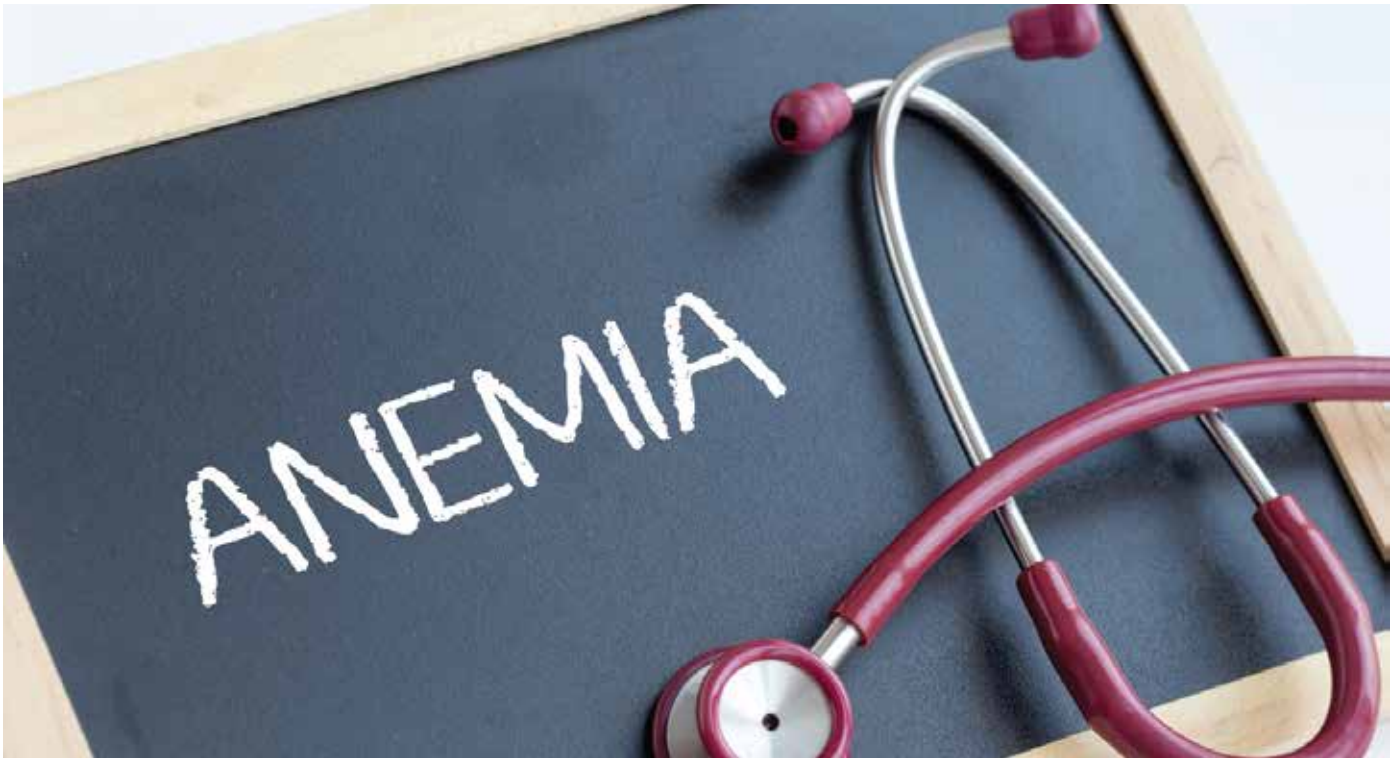
McKenzie SB (2015), Anemias of Disordered Iron Metabolism and Heme Synthesis. In: Kristin Landis-Piwowar eds. Clinical Laboratory Haematology 3rd Edition. Pearson, New Jersey, pp 199-230
Selvaraj N, Bobby Z, Sridhar MG (2008). Increased glycation of haemoglobin in chronic renal failure patients and its potential role of oxidative stress. Arch medic res 39:277-284.

World Health Organization, 2007. Micronutrient deficiencies. Battling iron deficiency anaemia [Online] Nutrition Program. http://www. who. int/nut/ida. htm.

World Health Organization, 2008. Worldwide prevalence of anaemia 1993-2005: WHO global database on anaemia./Edited by Bruno de Benoist, Erin McLean, Ines Egli and Mary Cogswell. In Worldwide prevalence of anaemia 1993-2005: WHO global database on anaemia. /edited by Bruno de Benoist, Erin McLean, Ines Egli and Mary Cogswell.

Zehir, A., Benayed, R., Shah, R.H., Syed, A., Middha, S., Kim, H.R., Srinivasan, P., Gao, J., Chakravarty, D., Devlin, S.M. and Hellmann, M.D., 2017. Mutational landscape of metastatic cancer revealed from prospective clinical sequencing of 10,000 patients. Nature medicine, 23(6), p.703.

.



Kgogomodumo Lodge Cultural Village & Campsite

Contact Information & Map

Tel: +267 5441716| Mobile (with Whatsapp): +267 73176799 | Fax: +267 544 1698
Email;kgogomodumolodge@gmail.com | Address: 1258 Sepojane Kanye
GPS Coodinates: Lat;24'57'31.6S Lon;25'20'38.8E

Clients Serviced

A SYSTEMATIC REVIEW OF FACTORS INFLUENCING PREVALENCE OF IRON DEFICIENCY ANEMIA IN THE ELDERLY IN WEST AFRICA

Author: Mbaki Mathumo

1. Department for Medical Laboratory Science, DDT College of Medicine.

2. Department of Medicine, DDT College of Medicine.

Corresponding Author *Dr Derrick D.Tlhoiwe, Dr Tumelo Tlhoiwe, Larry.L. Mweetwa*
Email: *journals@ddtcollegeofmedicine.com*

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935

Abstract|

HIV/TB co-infection remains a global concern in most of the developing countries worldwide. These diseases are well-known for their high morbidity and mortality rates both as separate entities and as a co-infection. However as comorbidity, these diseases have killed an estimated 0.77 million people worldwide with Africa taking up 72% of the global burden in 2017. Interestingly, recent evidence suggests that the high mortality rates can be attributable to other risk factors such low CD4 count, treatment non-compliance socioeconomic and other lifestyle issues. These have warranted further investigation.

Key words| TB/HIV co-infection, Prevalence, Risk factors, Systematic Review, Africa

Background

Tuberculosis (TB), is an air-borne disease caused by various strains of acid fast bacilli (AFB) belonging to a genus known as Mycobacterium from the Mycobacteriacea family (Kayser et al., 2005). The Mycobacteriacea family consists of clinically significant species such as M. tuberculosis, M. bovis, Bacillus Calmette-Guerin (BCG), M. africanum, M. caprae, M. microti, M. cannettii, and M. pinnipedii (Hossain and Ahmed, 2013). All these species form the M. tuberculosis complexes which consist of all Mycobacterium species capable of causing TB in humans (Caulfield et al., 2016). The most important and most common is the Mycobacteruim tuberculosis (WHO Global TB Report, 2018) and it is the main perpetrator in majority of the recorded pulmonary TB cases (Caulfield et al., 2016). TB infects all age groups and both sexes (Rhines, 2013).It is a communicable disease transmitted to other people air when the sick expel the bacteria into the air mostly through coughing and sneezing in the vicinity of those uninfected hence it is classified as an air-borne disease (Millet et al., 2013). These acid fast bacilli are capable of remaining dormant (Latent TB) in one's lungs until they become immunosuppressed by somewhat an underlying infection such as HIV/AIDS or by other risk factors such as tobacco smoking, alcohol and malnutrition resulting in the development of active TB (Basera et al., 2019). The symptoms of TB include constant cough lasting up to three weeks or more, night sweats, moderate fever, anorexia, unexplained weight loss, thoracic pain and lethargy (Shoukrie et al., 2018).

Epidemiology

According to WHO Global TB Report (2018), TB disease is ranked among the top 10 causes of death worldwide and is the leading cause from a single infectious agent above HIV/AIDS. It is estimated that 1.6 million people died from TB in 2017 (WHO Global TB Report, 2018). TB also boasts the highest morbidity worldwide. It is estimated that 10.0 million people developed TB disease in 2017 worldwide with a further 1.7 million people more with latent TB are predicted to develop active TB (WHO Global TB Report, 2018). However, it is the coinfection with HIV that warrants more scrutiny. UNAIDS (2019), indicated that approximately 37.9 million people globally are living with HIV and 1.9 million of them were newly diagnosed cases in 2018. Furthermore an estimated

0.77 million died from HIV/AIDS-associated illnesses such as TB (UNAIDS, 2019).HIV infection has long been linked with difficulty in control and reduction of TB worldwide (Gjergji et al., 2017). Globally in 2017, WHO indicated that 464 633 cases of TB/HIV co-infection were recorded with approximately 84% of these cases notified to be on anti-retroviral therapy.

The most commonly used diagnostic method of TB is sputum smear microscopy (Adam et al., 2016) which is the first line of diagnosis of pulmonary TB (Magalhães et al., 2018). Other TB detection methods include culture and Xpert/MTB RIF technology. The culture which considered is the gold standard for diagnosis is also highly sensitive with the ability to detect as low as 10 AFB/mL of sputum (Magalhães et al., 2018). However it is tedious and takes much longer (4-6 weeks) to produce final results

HIV

HIV/AIDS is transmittable from person to person, through coming into contact with body fluids with broken skin and sharing needles among drug abusers with an HIV-positive person (Beyrer et al., 2013).Risky sexual behaviours such as unprotected sex and having multiple sex partners are confirmed key risk factors behind the rapid spread of the HIV epidemic worldwide (Peltzer et al., 2018). The virus integrates its viral genome into host cell DNA and use reverse transcriptase mechanism to replicate and produce multiple virions which move on to infect other host cells (Venturini et al., 2014).It attacks mostly the CD4+ cells which are part of the cell mediated immunity directed against intracellular pathogens. Over time, the progression of HIV to full blown AIDS is hastened by decreasing immunity compounded by opportunistic infections such as TB and result in death (Pawlowski et al., 2012).

HIV/TB co-infection

Tuberculosis is the main opportunistic disease in the course of HIV (Tavares et al .,2017) The HIV/TB coinfection has been reported by a number of previous studies to be a known cause of death worldwide (WHO Global TB Report., 2018, Gjergi et al., 2017, Hua and Nhung et al., 2019). It has been reported that TB is the main cause of mortality among 26% of HIV associated deaths worldwide (Ji et al., 2018). Regionally, Africa topped Southeast Asia to first place with a total incidence rate TB among HIV patients of 27% and 3% respectively in 2017 (McNeil et al., 2019). The HIV virus attacks the immune system of the host thereby promoting the activation and proliferation of latent TB bacilli in the patient's lungs and body consequently developing into active TB (Trinh et al., 2015, Gunda et al., 2018).

To control TB and HIV WHO in conjunction with the Stop TB Partnership and the Global Fund to Fight AIDS launched the Find, Treat, All initiative (WHO Global TB Report, 2018). Healthcare workers are expected to screen HIV seropositive patients for any symptoms of active TB upon initiation of ART (Bisson et al., 2017). Timely initiation of ART, HIV testing for those with TB, use of Isoniazid Preventive therapy (IPT) (Churchyard and Swindells., 2019) and consistent treatment compliance are highly recommend by WHO to help reduce the spread of the HIV/TB co-infection (Trinh et al., 2015). Directly Observed Treatment Strategy (DOTS) has also been established as ways of controlling the TB epidemic by ensuring treatment compliance (Ruru et al., 2018). Adhering to the directly observed treatment therapy has been in recent years linked with reduced number of treatment failures, relapses and the development of multi-drug resistant TB (Ajao et al 2014). However the effectiveness of this initiative has been limited by non-compliance to both HIV and TB treatment (Duarte et al., 2018)

RESEARCH AIM

The aim of this study was to conduct a systematic review to evaluate the factors influencing the prevalence of HIV/TB co-infection in Africa.

OBJECTIVES

1. To identify risk factors influencing the prevalence of HIV/TB in Africa.
2. To evaluate the risk factors influencing the prevalence of HIV/TB in Africa.

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Out of 41 studies identified, 37 were left after duplicates were removed. 15 were excluded due to having abstracts only, poor methodology, means of comparison were inappropriate. Out of the 22 selected, 10 were further excluded due to year of publication and study location, from the 12 left 5 were excluded due to unsatisfactory results and conclusion. Only 7 were finally used.

However, despite the availability of revolutionary tests that allow for faster diagnosis and of new drugs and regimens that offer better and safer treatment the prevalence of HIV/TB remains high in most regions due to a host of other risk factors such as low CD4 count, treatment non-adherence and other socio-environmental factors including smoking, excessive alcohol and air pollution (Cui et al. 2018).

Fig 1.0 | Prisma Flow Chart

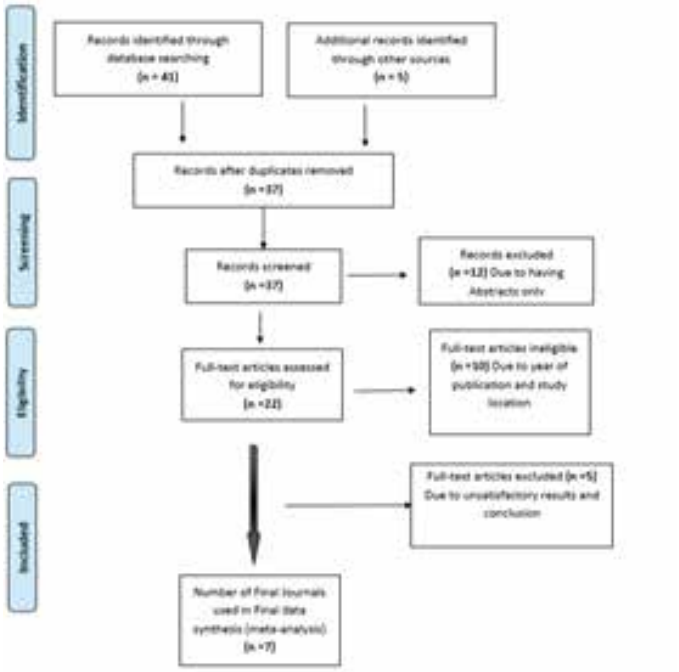
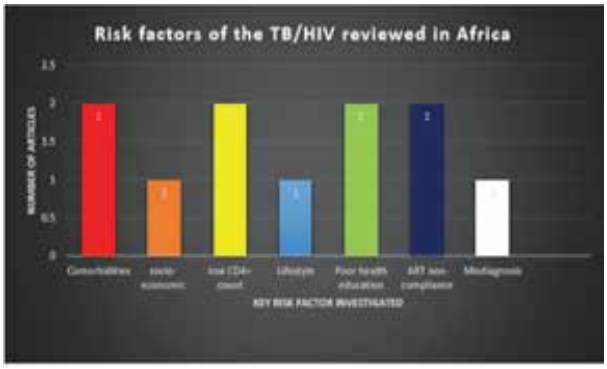


Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

Existing data based on the study of the 7 selected systematic reviews indicated the risk of developing active TB is much higher among the HIV positive than their counterparts. This is supported by the 56.7% prevalence reported in South Africa (Phetlhu et al., 2018). Contrastingly a study in Nigeria found a much lower prevalence rate of 17%. Moreover Aliyu et al., (2017) determined a prevalence rate of 23.9% of TB patients were HIV co-infected which falls between the already reported co-infection rates in their study in the Sub-Saharan Africa. The high prevalence of TB among people with HIV in Africa may be attributable to culture, high migration rates, mining, overcrowding and engaging predisposing sexual behaviour. As the CD4+ count decreases the viral load increases (Winter et al., 2018). The CD4+ cells are part of the protective cell mediated immunity responsible for the protection against the TB bacilli. The two articles reviewed reported the risk of TB development is highest when CD4+ count is as low as 168 cells/µL (Nagu et al., 2017).

Another comorbidity studied by 29% of the total number of articles is diabetes mellitus. Diabetes as a trio comorbidity with HIV and TB has associated with high morbidity in Africa. Alebel et al., (2019) found a prevalence rate of 8.9% DM among HIV infected TB patients. Oni et al., (2017) also discovered a significant risk of TB among diabetic HIV infected patients with HbA1c the main driver of the co-infection Timely Initiation into ART has been observed to be a paramount predisposing factor for HIV/TB. Moreover treatment adherence is crucial in the control of the spread of the TB infection and reduces the number of TBassociated deaths (Nagu et al 2017, MItku et al., 2016). The former author indicates Low use of ART in Tanzania has been reported to exacerbate the prevalence of HIV/TB. These findings are consistent with Hermans et al., (2015) who insists that the use of ART has resulted in decreased the HIV/TB notification rate in South Africa.

However not all HIV patients can adhere to both HIV and TB treatment prescribed consistently. Treatment noncompliance is also associated with lifestyle factors such as smoking and excessive alcohol consumption. (Nagu et al., 2017) insists that smoking and high alcohol intake instil further impaired immunity hence predisposing the patient to the development of active TB and multi-drug resistant TB on HIV-infected patients. These patients are also prone to forgetting to take their medication when drinking. Also late treatment seeking behaviour have been found be affected by these lifestyle factors (Habteyes et al., 2017).

This delay in seeking treatment may be attributed to misdiagnosis and human perception. Patients often misdiagnose the chronic TB cough for a mild flu cough symptom perceived as unworthy of seeking medical care for (Mavhu et al., 2010). These diseases are often associated with stigma and fear instilled by community on those with confirmed HIV and TB diagnosis. Only 14% of the articles of the articles studied investigated misdiagnosis as a risk of HIV/TB in Africa. This misdiagnosis and low treatment seeking behaviour is closely related with inaccessibility of health facilities in most developing countries (Ajao et al., 2014).

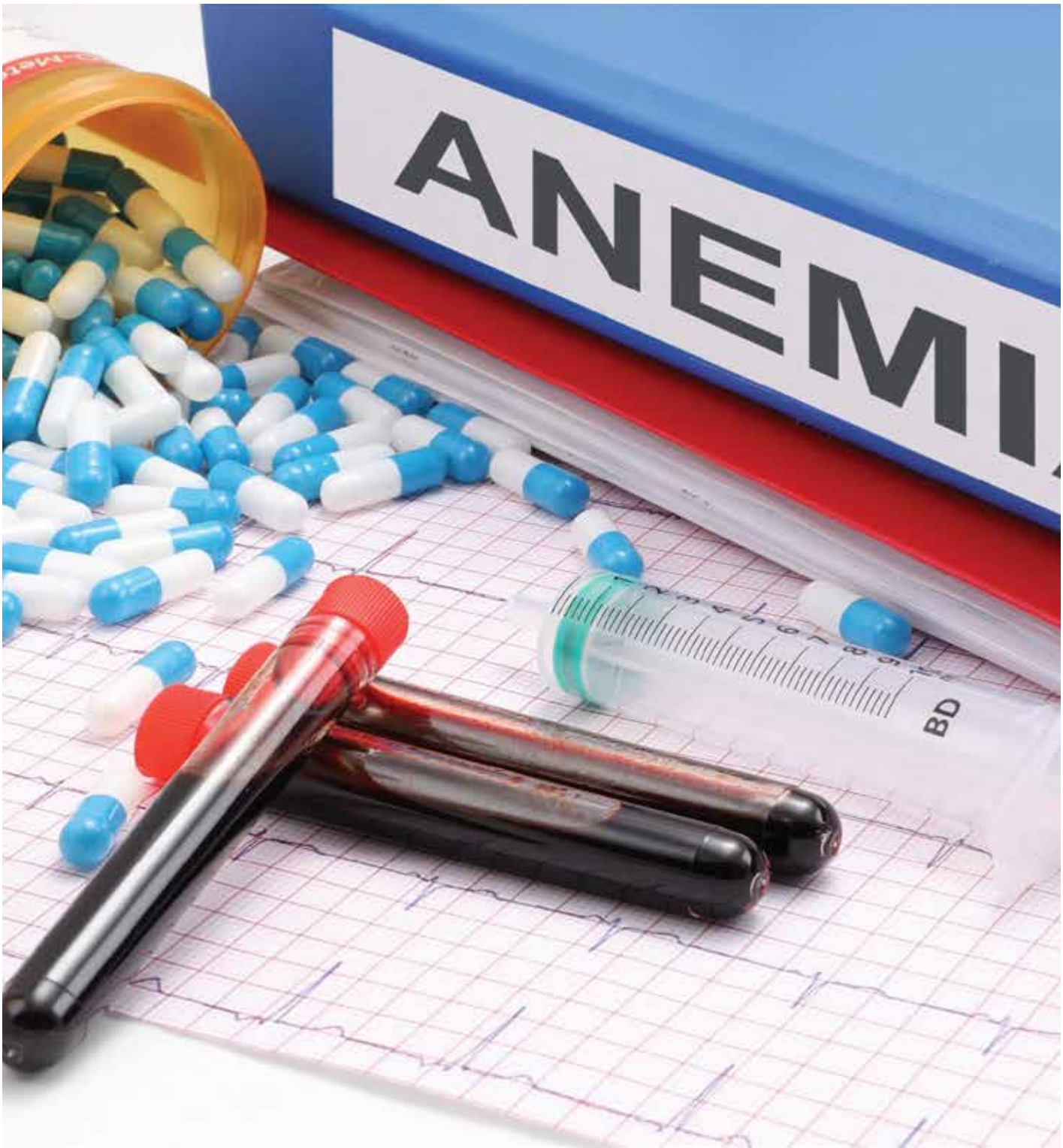
Moreover, the spread of the HIV/TB co-infection may be associated with socioeconomic factors such as migration from high incidence areas to low incidence areas, poverty and differences in social and cultural norms (Tavares et al., 2017). The latter's systematic review study revealed a high prevalence rate of HIV/TB coinfection of 2.8% to 85% among migrants in Europe from Africa. This may be associated with also other risk factors. Similarly, Collinson, (2010) observed that 48% of all reported mortality cases among migrants was due to HIV/TB co-infection.

Our studies show that a mere 29% of the research studies reviewed in this study indicated poor knowledge of health education is a significant predisposing factor of TB among ART non- compliant and misdiagnosed HIV infected patient. However of the 2 studies, 1 assessed knowledge among participating patients and the other among the HIV/TB patient

attending nurse. The sick with poor knowledge on the need for treatment are more likely to be HIV/ TB co-infected and not knows it until the symptoms have worsened (Bissalla et al., 2018) and by the time they seek treatment they have already infected their contacts. This may be due to low health education provision in most developing countries with limited resources.

CONCLUSION

The prevalence of the HIV/TB co-infection in Africa remains high due to a host of other predisposing factors such as lifestyle, socioeconomic factors, treatment non-compliance low CD4 count and lack of health education. These factors have each constantly contributed to the ever so high morbidity and mortality rates of TB among HIV-infected patients in Africa despite efforts by WHO to curb the syndemic. Comorbidities, low CD4+ count, non-compliance and poor health education are the most important. The afore mentioned risk factors were found to contribute more in terms of the development active TB among HIV-infected patients. Whereas lifestyle, socioeconomic factors and misdiagnosis are the least talked of factors. These risk factors are known to contribute less towards the risk of active TB development as compared to the former factors.



REFERENCES

Aliyu, G., El-Kamary, S.S., Abimiku, A.L., Blattner, W. and Charurat, M., 2018. Demography and the dual epidemics of tuberculosis and HIV: Analysis of cross-sectional data from Sub-Saharan Africa. PloS one, 13(9), p.e0191387.

Ajao, K.O., Ogundun, A.O., Afolabi, O.T., Ojo, T.O., Atiba, B.P. and Oguntunase, D.O., 2014. Treatment compliance and challenges among tuberculosis patients across selected health facilities in Osun State Nigeria. Afr J Med Med Sci, 43(s21-9).

Basera, T.J., Ncayiyana, J. and Engel, M.E., 2017. Prevalence and risk factors of latent tuberculosis infection in Africa: a systematic review and meta-analysis protocol. BMJ open, 7(7), p.e012636
Beyrer, C., Sullivan, P., Sanchez, J., Baral, S.D., Collins, C., Wirtz, A.L., Altman, D., Trapence, G. and Mayer, K., 2013. The increase in global HIV epidemics in MSM. Aids, 27(17), pp.2665-2678.

Bisson, G.P., Ramchandani, R., Miyahara, S., Mngqibisa, R., Matoga, M., Ngongondo, M., Samaneka, W., Koech, L., Naidoo, K., Rassool, M. and Kirui, F., 2017. Risk factors for early mortality on antiretroviral therapy in advanced HIV-infected adults. AIDS (London, England), 31(16), p.2217
Bultum J.A., Yigzaw N., Demeke, W and Alemayehu, M., 2018. Alcohol use amog Human Immunideficiency Virus infected patients attending antiretroviral therapy clinic in Bushoftu General Hospital, Oromiya region, Ethopia. PLoS ONE 13(3);e0189312.doi:10.1371/journalpone.018931.

Caulfield, A.J. and Wengenack, N.L., 2016. Diagnosis of active tuberculosis disease: From microscopy to molecular techniques. Journal of Clinical Tuberculosis and Other Mycobacterial Diseases, 4, pp.33-43.

Campbell, G.R. and Spector, S.A., 2019. DIABLO/SMAC mimetics selectively kill HIV-1-infected resting memory CD4+ T cells: a potential role in a cure strategy for HIV-1 infection. Autophagy, 15(4), pp.744-746
Castañeda-Hernández, D.M. and Rodriguez-Morales, A.J., 2013. Epidemiological Burden of Tuberculosis in Developing Countries. In Current Topics in Public Health. IntechOpen
Castelnuovo B., 2010. A review of compliance to anti tuberculosis treatment and risk factors for defaulting treatment in Sub Saharan Africa. African Health Sciences. 10 (4). Pp 320 – 324
Chatterjee, D. and Pramanik, A.K., 2015. Tuberculosis in the African continent: a comprehensive review. Pathophysiology, 22(1), pp.73-83
Chaudhary, S.K. and Mishra, B.M., An Alternative Technique of Sputum Concentration by Hypertonic SalineSodium Hydroxide Method for Increased Sensitivity of Sputum Smear Microscopy. EDITORIAL COMMITTEE, p.1
Check, J. and Schutt, R.K., 2011. Research methods in education. Sage Publications
Churchyard, G.J. and Swindells, S., 2019. Controlling latent TB tuberculosis infection in high-burden countries: A neglected strategy to end TB. PLoS medicine, 16(4), p.e1002787

Duarte, R., Lönnroth, K., Carvalho, C., Lima, F., Carvalho, A.C.C., Muñoz-Torrico, M. and Centis, R., 2018. Tuberculosis, social determinants and co-morbidities (including HIV). Pulmonology, 24(2), pp.115-119.

Gjergji, M., Bushati, J., Harxhi, A., Hafizi, H. and Pipero, P., 2017. Tuberculosis in HIV/AIDS patients. Adv Tech Clin Microbiol, 1(3), p.16.
World Health Organization, Global Tuberculosis Report 2018. Geneva:, Contract No.: WHO/CDS/TB/ 2018.20.

Gunda, D.W., Maganga, S.C., Nkandala, I., Kilonzo, S.B., Mpondo, B.C., Shao, E.R. and Kalluvya, S.E., 2018. Prevalence and Risk Factors of Active TB among Adult HIV Patients Receiving ART in Northwestern Tanzania: A Retrospective Cohort Study. Canadian Journal of Infectious Diseases and Medical Microbiology, 2018. Pp 17.

Hermans, S., Boulle, A., Caldwell, J., Pienaar, D. and Wood, R., 2015. Temporal trends in TB notification rates during ART scale-up in Cape Town: an ecological analysis. Journal of the International AIDS Society, 18(1), p.20240
Hossain A. and Ahmed Z., 2013. Detection and identification of Tubercle bacilli by different methods from sputum and blood samples of hospitalized patients in Bangladesh. American Journal of Advances in Medical Science. 1(2) pp 13-21
Kharsany A.B.M, and Karim Q.A., 2016. HIV Infection and AIDS in Sub-Saharan Africa: Current Status, Challenges and Opportunities. The Open AIDS Journal. 10. pp 34-48.

Khattter S, Sachdeva R, Goyal S, Singh A, Sharma B., 2017. Prevalence of Pulmonary Tuberculosis in Industrial Population in a Tertiary Care Center in North India. Saudi Journal of Medical and Pharmaceutical Sciences. 3(6B) Pp 639 -642.

Magalhães, J.L.D.O., Lima, J.F.D.C., Araújo, A.A.D., Coutinho, I.O., Leal, N.C. and Almeida, A.M.P.D., 2018. Microscopic detection of Mycobacterium tuberculosis in direct or processed sputum smears. Revista da Sociedade Brasileira de Medicina Tropical, 51(2), pp.237-239
Mavhu, W., Larke, N., Hatzold, K., Ncube, G., Weiss, H.A., Mangenah, C., Chonzi, P., Mugurungi, O., Mufuka, J., Samkange, C.A. and Gwinji, G., 2016. Safety, acceptability, and feasibility of early infant male circumcision conducted by nurse-midwives using the AccuCirc device: results of a field study in Zimbabwe. Global Health: Science and Practice, 4(Supplement 1), pp.S42-S54
Millet, J.P., Moreno, A., Fina, L., Del Baño, L., Orcau, A., De Olalla, P.G. and Cayla, J.A., 2013. Factors that influence current tuberculosis epidemiology. European Spine Journal, 22(4), pp.539-548
Noubiap, J.J., Nansseu, J.R., Nyaga, U.F., Nkeck, J.R., Endomba, F.T., Kaze, A.D., Agbor, V.N. and Bigna, J.J., 2019. Global prevalence of diabetes in active tuberculosis: a systematic review and meta-analysis of data from 2• 3 million patients with tuberculosis. The Lancet Global Health, 7(4), pp.e448-e460

Nugussie D., Mohammed G., and Tefera A., 2017. Prevalence of Smear-Positive Tuberculosis among Patients Who Visited Saint Paul's Specialized Hospital in Addis Ababa, Ethiopia. BioMed Research International 2017. Pp 1-6.

Obuku, E.A., Meynell, C., Kiboss-Kyeyune, J., Blankley, S., Atuhairwe, C., Nabankema, E., Jeffrey, N. and Ndungutse, D., 2012. Socio-demographic determinants and prevalence of Tuberculosis knowledge in three slum populations of Uganda. BMC public health, 12(1), p.536.

Oni, T., Berkowitz, N., Kubjane, M., Goliath, R., Levitt, N.S. and Wilkinson, R.J., 2017. Trilateral overlap of tuberculosis, diabetes and HIV-1 in a high-burden African setting: implications for TB control. European Respiratory Journal, 50(1), p.1700004.

Pawlowski, A., Jansson, M., Sköld, M., Rottenberg, M.E. and Källenius, G., 2012. Tuberculosis and HIV coinfection. PLoS pathogens, 8(2), p.e1002464.
Peltzer, K., 2018. Longitudinal analysis of HIV risk behaviour patterns and their predictors among public primary care patients with tuberculosis in South Africa. SAHARA-J: Journal of Social Aspects of HIV/AIDS, 15(1), pp.16.

Phetlhu, D.R., Bimerew, M., Marie-Modeste, R.R., Naidoo, M. and Igumbor, J., 2018. Nurses' Knowledge of Tuberculosis, HIV, and Integrated HIV/TB Care Policies in Rural Western Cape, South Africa. Journal of the Association of Nurses in AIDS Care, 29(6), pp.876-886.

Rhines, A.S., 2013. The role of sex differences in the prevalence and transmission of tuberculosis. Tuberculosis, 93(1), pp.104-107
Ruru, Y., Matasik, M., Oktavian, A., Senyorita, R., Mirino, Y., Tarigan, L.H., van der Werf, M.J., Tiemersma, E. and Alisjahbana, B., 2018. Factors associated with non-adherence during tuberculosis treatment among patients treated with DOTS strategy in Jayapura, Papua Province, Indonesia. Global health action, 11(1), p.1510592.

SADC., 2011. State of tuberculosis in the SADC region. SADC TB Report Directorate of Social & Human Development & Special Programs SADC Secretariat
Shoukrie, A., Alameen, A., Shaban, D., Alamari, M., Aboguttaia, N. and Askar, N., 2018. The Yield of Sputum Smear Direct Microscopy Using Ziehl-Neelsen Stain in Comparison with Lowenstein Jensen Culture on the Diagnosis of Pulmonary Tuberculosis in Tripoli-Libya. Mycobact Dis, 8(256), pp.2161-1068.

Tornheim, J.A. and Dooley, K.E., 2018. Challenges of TB and HIV co-treatment: updates and insights. Current Opinion in HIV and AIDS, 13(6), pp.486-491
Venturini, E., Turkova, A., Chiappini, E., Galli, L., de Martino, M. and Thorne, C., 2014. Tuberculosis and HIV co-infection in children. BMC infectious diseases, 14(1), p.S5.

Zheng, Z., Lin, J., Lu, Z., Su, J., Li, J., Tan, G., Zhou, C. and Geng, W., 2019. Mortality risk in the population of HIV-positive individuals in Southern China: A cohort study. PloS one, 14(2), p.e0210856.

A SYSTEMATIC REVIEW OF RISK FACTORS PREDISPOSING HIGH CHOLESTEROL LEVELS IN HIV PATIENTS IN EAST AFRICA

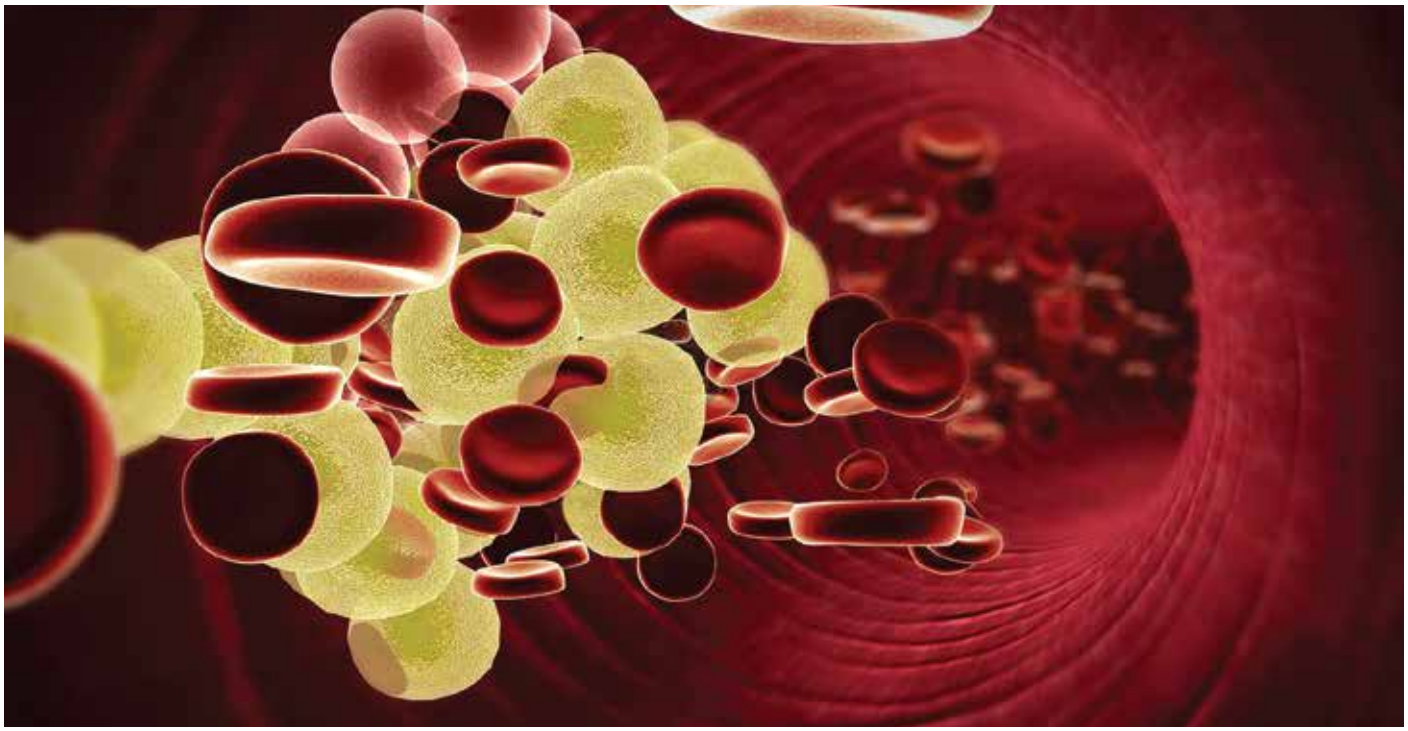
Author: Oarabile Mmolawa

1. Department for Medical Laboratory Science, DDT College of Medicine.

2. Department of Medicine, DDT College of Medicine.

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935

Corresponding Author *Dr Derrick D.Tlhoiwe, Dr Tumelo Tlhoiwe, Larry.L. Mweetwa*
Email: *journals@ddtcollegeofmedicine.com*



Abstract|

In 2018, an estimated 37.9 million people were living with human immunodeficiency virus acquired immunodeficiency syndrome (HIV/AIDS) worldwide; of them 20.6 million were living in East and southern Africa. About 2.1 million people were estimated to be living with HIV in Ethiopia, 2.5 million in Kenya,1.5 in Tanzania and 500 000 in Rwanda. The introduction of highly active antiretroviral therapy (HAART) has led to a marked reduction in AIDS related morbidity and mortality. Since its introduction patients have started to live longer, however co-morbid problems have emerged. Dyslipidaemia, insulin resistance, and diabetes are some of metabolic complications of long-term use of HAART

Key words| Cholesterol, HAART, HIV, cardiovascular

Background

Cholesterol is an organic molecule, is biosynthesized by all animal cells and is an essential structural component of animal cell membranes. It is a major component of cell membranes and the human body uses it to make; hormones, bile acids and vitamins (Harvey et al., 2011). Cholesterol level in the body comes from two sources, dietary intake and biosynthesis. There are different types of lipoproteins found in the body namely chylomicrons, very low density lipoproteins (VLDL), high density lipoprotein (HDL) and low density lipoprotein (LDL) (Bursill & Roach, 2007). LDL transports cholesterol from liver to cells and as a result it is often called the bad cholesterol because it contributes to fatty build-up in arteries and causing them to harden and narrow leading to a condition called atherosclerosis (Harris, 2010).

In 2018, an estimated 37.9 million people were living with human immunodeficiency virus acquired immunodeficiency syndrome (HIV/AIDS) worldwide; of them 20.6 million were living in East and southern Africa. About 2.1 million people were estimated to be living with HIV in Ethiopia,2.5 million in Kenya,1.5 in Tanzania and 500 000 in Rwanda (Wondimeneh et al., 2012).

The introduction of highly active antiretroviral therapy (HAART) has led to a marked reduction in AIDS related morbidity and mortality. Since its introduction patients have started to live longer, however co-morbid problems have emerged (WHO, 2010). Dyslipidemia, insulin resistance, and diabetes are some of metabolic complications of long-term

use of HAART (Sadr et al., 2005). Lipid abnormalities were seen among people living with HIV prior to the introduction of HAART treatment (Anastos et al., 2007). People with untreated HIV often had raised LDL cholesterol and declining HDL cholesterol.

RESEARCH AIM

The main aim of the study is to conduct a systematic review to explore factors responsible for the high cholesterol levels in HIV patients in East Africa.

OBJECTIVE

i. To collect data from previous studies that has been conducted on cholesterol level in patients from East Africa with HIV infection.
ii. To identify the factors responsible for cholesterol levels among HIV patients from East Africa

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 4 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 75 studies identified, 22 were excluded due to having abstract only. Out of the 53 selected, 48 were further excluded due to year of publication. Only 5 were finally used.

Fig 1.0 | Prisma Flow Chart

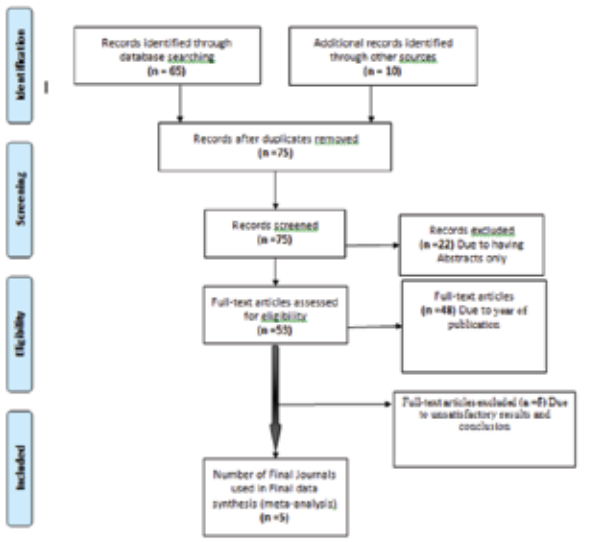
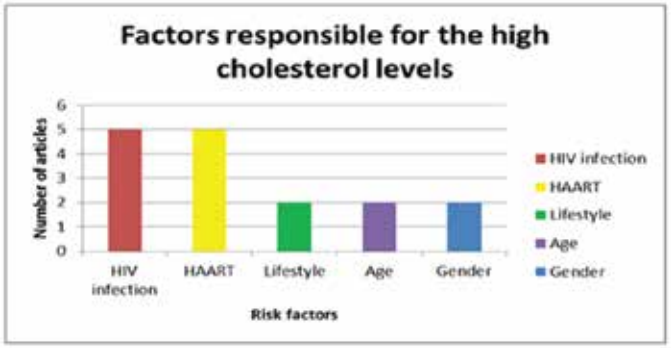


Fig 1.2 KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

Figure 2 above shows a graph that indicates all the 5 articles reported the risk factors that increase the cholesterol prevalence. These were HIV infection, HAART treatment, lifestyle, age and gender. The factors will be discussed briefly below.

HIV INFECTION

From the results, 5 articles show HIV infection as one of the factors increasing the prevalence of cholesterol. Researchers revealed that HIV infection is one of the factors that put infected individuals under the risk of high cholesterol level which later is associated with CVD and stroke (WHO, 2010). Also thesis review have shown that HIV infection contribute by 100% to high cholesterol level which is global crisis. Findings of the study conducted by (Adal et al., 2018) shows that the mean value of all lipid profile was significantly higher among on HIV positive individual compared to HIV negative individual.

HAART

From the results, 5 articles show HAART as one of the factors increasing the prevalence of cholesterol. Thesis reviews have shown that HAART contribute by 100% to high cholesterol level which is global crisis. (Amberbir et al., 2018) revealed that a the mean value of all lipid profile was significantly higher among on HAART HIV positive persons on HAART as compared to HAART naïve HIV positive persons and HIV negative persons. Moderate burden of dyslipidemia among Malawian adults on current ART regimens. Patients with elevated TC and elevated triglyceride/HCL-c ratio had significantly higher predicted CVD risk. Also the study by (Riddler et al., 2003) observed significant increase in total cholesterol and triglycerides in 110 patients after the treatment with the HAART.

LIFESTYLE

From the results, 5 articles show lifestyle as one of the factors increasing the prevalence of cholesterol. Thesis reviews have shown that lifestyle contribute by 40% to high cholesterol level which is global crisis. Obesity is a significant CVD risk factor, and excess body weight is closely linked to dyslipidemia

In a study by (WHO, 2006) the relationship of BMI with abnormal lipids (when smoking habits and education as well as age and race are controlled in regression analyses) showed BMI was a risk factor for elevated total cholesterol and triglyceride, but was not associated with low HDL-C and high LDL-C. Other studies reported higher prevalence ratios for high blood cholesterol among overweight men and women and obese men and women than among normal weight persons (Dorah et al., 2017). Another study showed that the prevalence of high blood cholesterol and mean levels of cholesterol were higher with BMI, low HDL-C increased as levels of BMI increased (Adal et al., 2018).Biological variability in total cholesterol, HDL-C, LDL-C, and triglyceride, and factors such as heredity, diet, and exercise are responsible for the variability between BMI and serum lipids (Adal et al., 2018).

GENDER

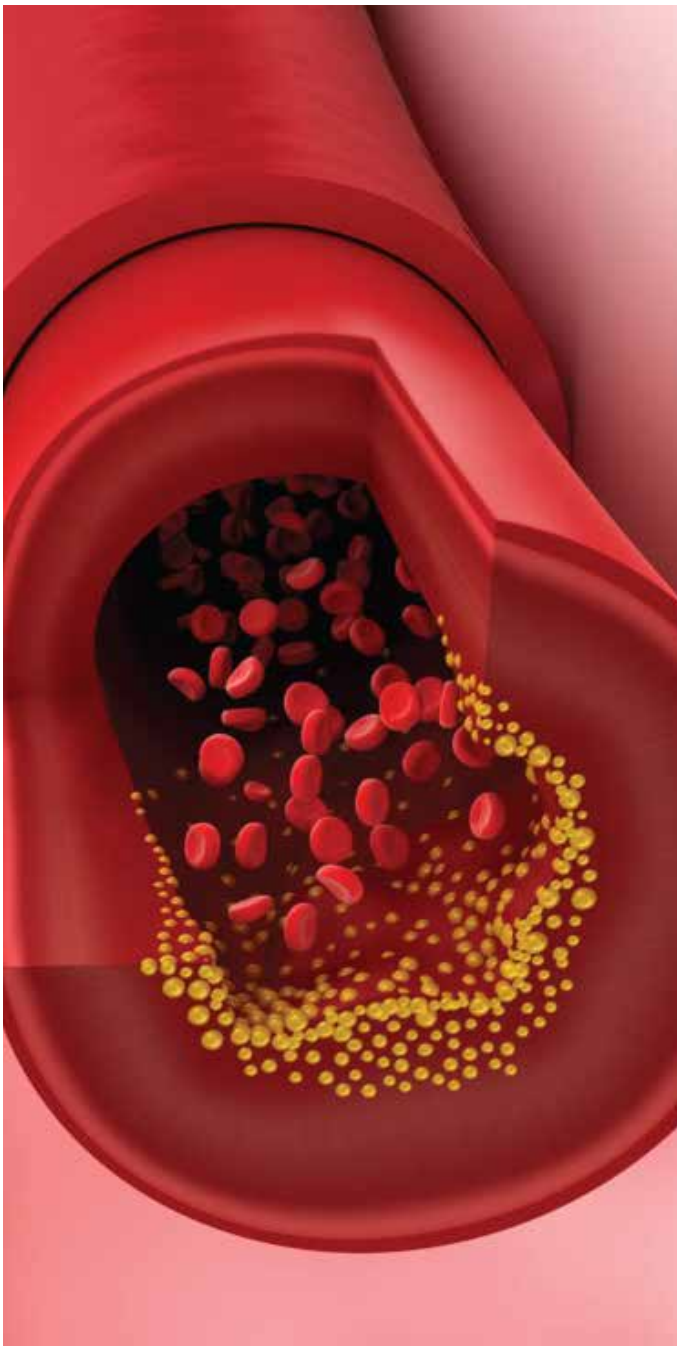
From the results, 5 articles show that age and gender as one of the factors increasing the prevalence of cholesterol. Thesis reviews have shown that gender contribute by 40% to high cholesterol level which is global crisis. In the study conducted by (WHO, 2010), it was found that total cholesterol, LDL-C, and triglyceride levels were significantly higher in women than in men. It was also found that the prevalence of dyslipidemia was higher in women than in men with 61% and 53% respectively, the prevalence of dyslipidemia for women gradually increased and surpassed the prevalence for men as patient are on HAART for longer time. This finding could be a reflection of menopause. Postmenopausal women, in addition to their tendency to gain weight, are also susceptible to alterations in lipid metabolism. Due to estrogenic deprivation, which increases serum levels of total cholesterol, lipoproteins, and triglycerides, this results in a highly favorable lipid profile to atherogenesis in that population (Amberbir et al., 2018).

AGE

As shown in the figure 1 above, age is one of the risk factor of high cholesterol level. The figure 1 above shows that age contributes about 40% to high cholesterol level. Aging is associated with a progressive decline in numerous physiological processes, leading to an increased risk of health complications and disease. By delivering oxygenated blood to all tissues in the body, the health of the cardiovascular system is vital for health of every tissue and longevity of the organism as a whole (WHO, 2010). Aging has a remarkable effect on the heart and arterial system, leading to an increase in CVD including atherosclerosis, hypertension, myocardial infarction, and stroke. Increasing blood pressure and total cholesterol were associated with increased lifetime risk for CVD and with shorter median survival in both men and women for all patients aged between 40 to 80 years (Dillon et al., 2013).

CONCLUSION

Out of the 5 articles, HIV and HAART treatment factors were the most common risk factors influencing high cholesterol level in East Africa, followed by lifestyle, age and gender.
In conclusion, the raised total cholesterol, LDL-c and triglyceride values were significantly and positively associated with HIV infection and the use of HAART treatment. The mean value of all lipid profile was significantly higher among HIV positive patients on HAART HIV as compared to HAART naïve HIV positive persons and other risk factors such as lifestyle, age and gender. Increased age and blood pressure, being on HAART, and increased in body mass index were the determinant factors of dyslipidemia among HIV positive persons. Therefore, further longitudinal studies with long term follow-up are needed to explore more on the causes of dyslipidemia and the pattern of lipid profile changes with HAART initiation in HIV positive persons in resource



REFERENCES

Adal, M., Howe, R., Kassa, D., Aseffa, A. and Petros, B., 2018. Associations of gender and serum total cholesterol with CD4+ T cell count and HIV RNA load in antiretroviral-naïve individuals in Addis Ababa. BMC public health, 18(1), p.943.

Agomuoh D, Akpa M, Alasia D. Lipid profile of healthy adult Nigerians in Port Harcourt, Nigeria. Nigerian Journal of Medicine. 2006; 15(2):137-140

Akpovi, L. H. S. Gbaguidi, E. Anago et al., "Tuberculosis treatment raises total cholesterol level and restores high density lipoprotein cholesterol (HDLC) in patients with pulmonary tuberculosis," African Journal of Biotechnology, 2013; vol. 12, no. 41. Rouleau, C. Fortin, B. Trotier, R. Lalonde, N. Lapointe, P. Cote, et al., "Antiretroviral therapy for adults infected with HIV: Guidelines for health care profesionals from Quebec HIV care commettee," Can J Infect Dis Med Microbiol, Vol. 22(2), pp.52-60, 2011.

Amberbir, A., Singano, V., Matengeni, A., Ismail, Z., Kawalazira, G., Chan, A.K., Sodhi, S.D. and van Oosterhout, J.J., 2018. Dyslipidemia among rural and urban HIV patients in south-east Malawi. PloS one, 13(5), p.e0197728.

Anastos K, Lu D, Shi Q, Tien PC, Kaplan RC, Hessol NA, Cole S, Vigen C, Cohen M, Young M, Tien, Phyllis C, Vigen C, Justman J: Association of serum lipid levels with HIV sero-status, specific antiretroviral agents and treatment regimens. J Acquir Immune Defic Syndr 2007; 459:34–42.

Bain, L.E.; Nkoke, C.; Noubiap, J.J.N. UNAIDS 90–90–90 targets to end the AIDS epidemic by 2020 are not realistic: comment on "Can the UNAIDS 90–90–90 target be achieved? A systematic analysis of national HIV treatment cascades". BMJ Global Health 2017, 2, e000227

Bayenes, H.W., Ahmed, M.K., Shenkute, T.Y., Ayenew, Y.A. and Bimerew, L.G., 2014. Prevalence and predictors of dyslipidemia on HAART and HAART naive HIV positive persons in Defense Hospital, Addis Ababa, Ethiopia. American Journal of Health Research, 2(5), pp.303-309.

Behane, T. A. Yami, F. Alemseged, T. Yemane, L. Hamza, M. Kassim, et al., "Prevalence of lipodystrophy and metabolic syndrome among HIV positive individuals on Highly Active Anti-Retroviral treatment in Jimma, South West Ethiopia," Pan Afr Med J, Vol.13, pp.43, 2012.

Benjamin, L.A., Corbett, E.L., Connor, M.D., Mzinganjira, H., Kampondeni, S., Choko, A., Hopkins, M., Emsley, H.C., Bryer, A., Faragher, B. and Heyderman, R.S., 2016. HIV, antiretroviral treatment, hypertension, and stroke in Malawian adults: a case-control study. Neurology, 86(4), pp.324-333.

Brewinski M, Megazzini K, Hance LF, Cruz MC, Pavia-Ruz N, et al. Dyslipidemia in a cohort of HIV-infected Latin American children receiving highly active antiretroviral therapy. J Trop Pediatr. 2011; 57(5):324–332. [PubMed: 20889625]

Brezzo C. Informed national sober progress realizations Argentina. [accessed 22May2015];2014www.unaids.org/sites/default/files/country/documents//ARG_narrative_report_2014.pdf. [Ref list]

Bursill, C.A., & P.D. Roach.. A green tea catechin extract up regulates the hepatic low density lipoprotein receptor in rats. Lipids. 2007; 42:621-627

Cahn, P., Madero, J.S., Arribas, J.R., Antinori, A., Ortiz, R., Clarke, A.E., Hung, C.C., Rockstroh, J.K., Girard, P.M., Sievers, J. and Man, C., 2019. Dolutegravir plus lamivudine versus dolutegravir plus tenofovir disoproxil fumarate and emtricitabine in antiretroviral-naive adults with HIV-1 infection (GEMINI-1 and GEMINI-2): week 48 results from two multicentre, double-blind, randomised, non-inferiority, phase 3 trials. The Lancet, 393(10167), pp.143-155.

Creswell, J.W. and Creswell, J.D., 2017. Research design: Qualitative, quantitative, and mixed methods approaches. Sage publications.

Daniels, T.F., K.M. Killinger, J.J. Michal, R.W. Wright, Jr., & Z. Jiang. Lipoproteins , cholesterol homeostasis and cardiac health. International Journal of Biological Sciences. 2009.

Dillon DG, Gurdasani D, Riha J, Ekoru K, Asiki G, Mayanja BN, et al (2013) Association of HIV and ART with cardiometabolic traits in sub-Saharan Africa: a systematic review and meta-analysis. Int J Epidemiol 42: 1754±1771. https://-doi.org/10.1093/ije/dyt198 PMID: 24415610.

Divala OH, Amberbir A, Ismail Z, Beyene T, Garone D, Pfaff C, et al The burden of hypertension,diabetes mellitus, and cardiovascular risk factors among adult Malawians in HIV care: consequences for integrated services. BMC Public Health, 2016; 16: 1243

El-Sadr W, Mullin C, Carr A, Gibert C, Rappoport C, et al. Effects of HIV disease on lipid, glucose and insulin levels: results from a large antiretroviral-naïve cohort. HIV Med. 2005; 6(2):114–121. [PubMed: 15807717]

AIDS 2002; 16:569–577.

Fraser, R., Ingram, M.C., Anderson, N.H., Morrison, C., Davies, E. and Connell, J.M., 1999. Cortisol effects on body mass, blood pressure, and cholesterol in the general population. Hypertension, 33(6), pp.1364-1368.

Glueck CJ, Kelley W, Gupta A, Fontaine RN, Wang P, Gartside PS. Prospective 10-year evaluation of hypobetalipoproteinemia in a cohort of 772 firefighters and cross-sectional evaluation of hypocholesterolemia in 1,479 men in the National Health and Nutrition Examination Survey I. Metabolism. 1997; 46(6):625-33

Grover SA, Coupal L, Gilmore N, et al. Impact of dyslipidemia associated with highly active antiretroviral therapy on cardiovascular risk and life expectancy. Am J Cardiol 2005; 95:586–91.

Grunfeld, C, "Dyslipidemia and its treatment in HIV infection," Top HIV.Med, Vol. 18, pp. 112–18, 2010.

Grunfeld, C., Kotler, D.P., Shigenaga, J.K., Doerrler, W., Tierney, A., Wang, J., Pierson Jr, R.N. and Feingold, K.R., 1991. Circulating interferon-a levels and hypertriglyceridemia in the acquired immunodeficiency syndrome. The American journal of medicine, 90(2), pp.154-162.

Guérin, M., Le Goff, W., Lassel, T.S., Van Tol, A., Steiner, G. and Chapman, M.J., 2001. Proatherogenic role of elevated CE transfer from HDL to VLDL1 and dense LDL in type 2 diabetes: impact of the degree of triglyceridemia. Arteriosclerosis, thrombosis, and vascular biology, 21(2), pp.282-288.

Harris, JR. Cholesterol binding and cholesterol transport proteins: structure and function in health and disease. Dordrecht: Springer. 2010; ISBN 978-90-481-8621-1.

Harvey, R. & A., Ferrier, D. R. Cholesterol and steroid metabolism In: (Rhyner, S.), Biochemistry, 5th edn, USA: Lippincott Williams & Wilkins; 2011; pp227-237.

Hellerstein, M.K., Grunfeld, C.A.R.L., Wu, K.E.N.N.E.T.H., Christiansen, M.A.R.K., Kaempfer, S.U.Z.A.N.N.E., Kletke, C.A.T.H.Y. and Shackleton, C.H., 1993. Increased de novo hepatic lipogenesis in human immunodeficiency virus infection. The Journal of Clinical Endocrinology & Metabolism, 76(3), pp.559-565.

Jones R, Sawleshwarkar S, Michailidis C, et al. Impact of antiretroviral choice on hypercholesterolemia events: the role of the nucleoside reverse transcriptase inhibitor backbone. HIV Med 2005; 6:396–402.

Kim, R.J. and Rutstein, R.M., 2010. Impact of antiretroviral therapy on growth, body composition and metabolism in pediatric HIV patients. Pediatric Drugs, 12(3), pp.187-199.

Kumar, P.; Suri, D.; Vignesh, P.; Verma Attri, S.; Kumar Bhalla, A.; Singh, S. Metabolic Abnormalities and Clinical Lipodystrophy in Children With Human Immunodeficiency Virus Infection: A Report From a Tertiary Care Center in India. Pediatr. Infect. Dis. J. 2017, 36, e313–e316. [CrossRef]

Lewden, C, T. May, E. Rosenthal, C. Burty, F. Bonnet, D. Costagliola, et al., "Changes in causes of death among adults infected by HIV between 2000 and 2005: The "Mortalité 2000 and 2005" surveys (ANRS EN19 and Mortavic)," J Acquir Immune Defic Syndr, 48(5):590-8, 2008.

Lewis, G.F. and Rader, D.J., 2005. New insights into the regulation of HDL metabolism and reverse cholesterol transport. Circulation research, 96(12), pp.1221-1232.

Li, T., Dai, Y., Kuang, J., Jiang, J., Han, Y., Qiu, Z., Xie, J., Zuo, L. and Li, Y., 2008. Three generic nevirapine-based antiretroviral treatments in Chinese HIV/AIDS patients: multicentric observation cohort. PLoS One, 3(12), p.e3918.

Liang, J.S., Distler, O., Cooper, D.A., Jamil, H., Deckelbaum, R.J., Ginsberg, H.N. and Sturley, S.L., 2001. HIV protease inhibitors

Manuthu, EM. M.D. Joshi, G.N. Lule, E. Karari, "Prevalence of dyslipidemia and dysglycaemia in HIV infected patients," East Afr Med J, Vol. 85(1), pp.10-7, 2008.

Martens GW, Arikan MC, Lee J, Ren F, Vallerskog T, Kornfeld H. Hypercholesterolemia impairs immunity to tuberculosis. Infection and immunity. 2008; 76(8):3464-3472.

Metwally & H.A.Raheem, "Lipid profile in tuberculous patients: A preliminary report," Life Science Journal, 2012; vol. 9, no.1, pp. 719–722.

hospital. International clinical pathology journal, 4(3).

Nickolas, T.L.& ,Appel, G.B Hyperlipidemia and thrombotic complications in patients with membranous nephropathy.Semin.Nephrol; 2003; 23(4):406-11.

Padmapriyadarsini, C, S. Ramesh Kumar, N. Terrin, G. Narendran, P.A. Menon, G. Ramachandran, et al., "Dyslipidemia among HIV-infected Patients with tuberculosis taking once-daily nonnucleoside reversetranscriptase inhibitor-based antiretroviral therapy in India," Clin Infect Dis, Vol.52(4), pp.540-6, 2011.

Pawlowski, A, M. Jansson, M. Sk¨old, M. E. Rottenberg, and G. K¨allenius, "Tuberculosis and HIV co-infection," PLoS Pathogens, 2012; vol. 8, no. 2,Article ID e1002464.

Powell, J.T., 1998. Vascular damage from smoking: disease mechanisms at the arterial wall. Vascular medicine, 3(1), pp.21-28.

Pujari SN, Dravid A, Naik E, et al. Lipodystrophy and dyslipidemia among patients taking first-line, World Health Organization recommended highly active antiretroviral therapy regimens in Western India.J Acquir Immune Defic Syndr 2005; 39:199–202.

Riddle, T.M., Kuhel, D.G., Woollett, L.A., Fichtenbaum, C.J. and Hui, D.Y., 2001. HIV protease inhibitor induces fatty acid and sterol biosynthesis in liver and adipose tissues due to the accumulation of activated sterol regulatory element-binding proteins in the nucleus. Journal of Biological Chemistry, 276(40), pp.37514-37519

Wondimeneh, Y. D. Muluye, & Y. Belyhun, "Prevalence of Pulmonary tuberculosis and immunological profile of HIV coinfected patients in Northwest Ethiopia," BMC Research Notes, 2012; vol. 5, article 331.

World Health Organization, 2006. Food and nutrition policy for schools: A tool for the development of school nutrition programmes in the European Region (No. EUR/06/5073063). Copenhagen: WHO Regional Office for Europe.

A SYSTEMATIC REVIEW OF SENSITIVITY PATTERNS OF STAPHYLOCOCCUS AUREAS IN SOUTH AMERICA

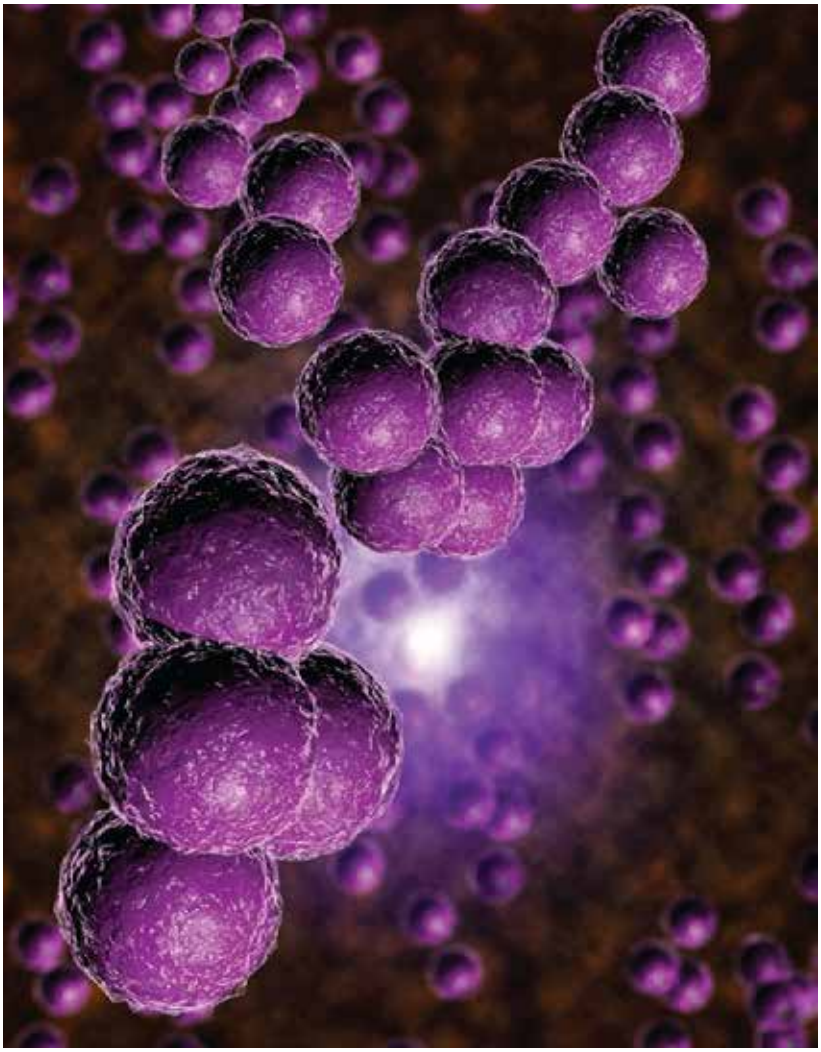
Author: Olorato Garebagae

1. Department for Medical Laboratory Science, DDT College of Medicine.

2. Department of Medicine, DDT College of Medicine.

Corresponding Author *Dr Derrick D.Tlhoiwe, Dr Tumelo Tlhoiwe, Larry.L. Mweetwa*
Email: *journals @ddtcollegeofmedicine.com*

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935



Abstract|

Staphylococcus aureus is a microorganism responsible for causing community and hospital-acquired infections. It has high morbidity and mortality rates. It has a remarkable capability of evolving different mechanisms of resistance to most antimicrobial agents and it's been evident over the years. The reason for resistance is through the expression of the mecA gene which codes the penicillin-binding protein (PBP2a). The level of resistance correlates to the amount of PBP2a production. Antimicrobial resistance of Staphylococcus aureus especially methicillin-resistant S. aureus (MRSA) continues to be a problem for health workers worldwide becoming a global health concern. Few information on the antibiotic sensitivity patterns of S. aureus isolates been reported and its prevalence on MRSA especially in South America.

Key words| Methicillin resistant staphylococcus aureus, Staphylococcus Cassette Chromosome MEC, Antibiogram

Background

Staphylococcus aureus is the most common human bacterial pathogen worldwide. Staphylococcus aureus, a Gram-positive, coagulase-positive pathogen belonging to the family Staphylococcaceae, is a spherical bacterium of approximately 1 um in diameter forming grape-like clusters (Mash, 2010). S. aureus is a commensal that is often present asymptomatically on parts of the human body such as skin, skin glands, and mucous membranes, including noses and guts of healthy individuals (Lakhundi,.2018) Staphylococcus aureus causes both hospital and community-acquired infections. Colonization of Staphylococcus aureus is found in the anterior naves (Durgadas et al., 2009).

Staphylococci have a remarkable ability to rapidly adapt to antibiotic pressure. In particular, methicillin-resistant S. aureus (MRSA) pose problems, because in addition to an intrinsic resistance to virtually all β-lactams, (Berger and Rohrer 2002).

MRSA is a specific strain of the S. aureus, which is resistant to methicillin and all β-lactams. The first MRSA was reported in 1961, only shortly after the introduction of the first penicillinase-resistant β-lactam into clinical use (Jevons 1961). Since then, a number of different clones of MRSA have arisen and spread throughout the world. Infections with these strains are more difficult and expensive to treat, leading to significant morbidity and mortality and to an increase in healthcare burden.

There are some factors that contribute to antibiotic resistance that is self-medicating, long hospital stay, opportunistic infections that weaken the immune system, hygiene and living conditions. According to Martone WJ, Nichols RL2001, Surgical site infection (SSI) complicates 2%–5% of all surgeries in the United States, resulting in a total of 300,000–500,000 infections each year. SSIs are associated with increased morbidity rates, mortality rates and costs and they are responsible for additional annual hospital

charges of $1.6 billion in the United States alone. Methicillin resistance further complicates therapy for S. aureus SSI. The prevalence of MRSA has increased radically since it was first described in the 1960s (NNIS, 2001). Ever since 1990, several epidemic MRSA clones have spread in Latin America. The multidrug-resistant Brazilian clone is widespread, especially in Brazil and Argentina, but more recently clones with susceptibility to a range of antibiotics have been detected in Brazil, whereas in Argentina, as in Chile, Colombia and Paraguay, the multidrug-resistant Cordobes/Chilean clone prevails. In Mexico, the New York/Japan clone is most frequent.
Clinically, infections caused by HA-MRSA strains are also associated with higher mortality and morbidity and some CA-MRSA strains express additional virulence factors that enable them to cause more serious diseases (CDC 2002).

According to the CDC 2002 report, hospital environments play an important role in nosocomial infection in that healthcare environments contain a diverse population of microorganisms. Transfer of microorganisms from environment surfaces to hosts can occur indirectly, for example, by hand contact with other surfaces caused by lack of sterilisation or disinfection. In the United States it has been estimated that over 2 million people suffer infection by some multidrug-resistant organism (MDRO) each year and about 23000 die as a direct result of these infections (Kardos, N., 2017).

Diagnostic method to confirm virulence and resistance

Antibiograms are used for detecting antimicrobial resistance and monitoring. They help guide the clinician and pharmacist in selecting the best empiric antimicrobial treatment in the event of pending microbiology culture and susceptibility results, (Pakyz, 2007). Antibiograms are generated by the laboratory using aggregate data from a hospital or healthcare system; data are summarized periodically and presented showing percentages of organisms tested that are susceptible to a particular antimicrobial drug. Only results for antimicrobial drugs that are routinely tested and clinically useful should be presented to clinicians.

MRSA detection is done with Kirby-Bauer Oxacillin disc diffusion test, 6 µg/ml, in Mannitol-salt agar, Oxacillin MIC or with Müller Hinton agar and inoculum at 0.5 McFarland 2008, Journal of medical microbiology. The reason resistance occurs is through the expression of the mecA gene. The modified Kirby-Bauer disc diffusion technique is being used to determine the susceptibility of the isolates to antibiotics eg, Cefoxitin, Ampicillin, ciprofloxacin, ceftriaxone, Gentamicin, Amoxicillin-Clavulanic Acid, Vancomycin, Pefloxacin, Erythromycin, Clindamycin and Nalidixic Acid.

SOUTH AMERICAN COUNTRIES ON MRSA

Latin America is no exception to the prominent nosocomial bacterial pathogen (MRSA) associated with significant increase in morbidity and mortality (Bereket,. 2012). From the years 1966–August 2008 published articles relating to the clonal evolution of MRSA in Latin America were determined, MRSA clones. The countries were Argentina, Bolivia, Brazil, Chile, Colombia,Costa Rica, Cuba, Dominican Republic, Ecuador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela). Several epidemic MRSA clones have spread in Latin America especially in Brazil and Argentina, but more recently clones with susceptibility to a range of antibiotics have been detected in Brazil,(Eduardo Rodríguez-Noriega et al.,2009) whereas in Argentina, Chile, Colombia and Paraguay, the multidrug-resistant Cordobes/Chilean clone prevails. In Mexico, the New York/Japan clone is most frequent. Data were not available from every country and, despite the increasing prevalence of community MRSA infections.

BRAZIL

Most hospital-acquired infections caused by MRSA (HA-MRSA) are associated with a relatively small number of epidemic clones spread over different continents, including Brazilian epidemic/Hungarian, Iberic, New York/Japanese and paediatric SCC mec clones (Ribeiro, 2005).CA-MRSA infections are currently emerging in Brazil, posing a challenge in terms of diagnosis and initiation of effective therapy in order to reduce morbidity and mortality (Rozenbaum, 2009). Successful management of bacteraemia and other invasive infections by CA-MRSA will depend on the timely recognition of this microorganism as a cause of severe infections. Hence, the source of S. aureus bacteraemia and the metastatic complications need to be identified in order to ensure the best treatment. The duration of antimicrobial therapy will depend on the extent of infection (Rozenbaum, 2009).

The duration of antimicrobial therapy depends on the extent of infection. Long-term antibiotic therapy is sometimes necessary to guarantee successful treatment. Treatment failure and complications from haematogenous osteomyelitis have been repeatedly linked to a short duration of antimicrobial therapy (Rozenbaum, 2009). According to a research by Rozenbaum, 2009, Clindamycin should not be used for empirical treatment in communities with high rates of inducible clindamycin resistance, since treatment failures may occur. Thus, in case of erythromycin resistance, the D test for screening inducible resistance to clindamycin should be performed before prescribing clindamycin.
It was recently reported that clindamycin markedly suppressed the production of PVL, haemolysins, and toxic shock syndrome toxin 1(Rozenbaum, 2009).Agents with activity against CA-MRSA available for parenteral therapy include vancomycin, teicoplanin, linezolid, daptomycin, tigecycline, and trimethoprim-sulfamethoxazole.

TLHOIWE & TLHOIWE FOUNDATION

BLESSING GOD & MANKIND

PROVIDING A HELPING HAND FOR HUMAN NEEDS WHENEVER AND WHEREVER IT CAN.

However, no controlled trials comparing the efficacy of parenteral drugs in the treatment of serious CA-MRSA infections are available. Rozenbaum, 2009 suggested that suspected life-threatening CA-MRSA infections deserve prompt initiation of empirical effective combination therapy against both MRSA and MSSA, until identification and susceptibility testing are completed.

COLOMBIA

In Latin America, community-associated MRSA (CA-MRSA) have only been described in the southern area of the continent (Uruguay and Brazil).A study was done involving two patients. Tissue culture from secretions showed gram-positive cocci in clusters on the gram stain, and subsequent cultures yielded MRSA. Species identification and presence of the mecA gene were confirmed by Polymerase Chain Reaction (Alvarez, 2006). Minimum Inhibitory Concentrations were determined by using the agar diffusion test, according to Clinical and Laboratory Standards Institute recommendation. Both organisms were susceptible to vancomycin, teicoplanin, chloramphenicol, linezolid, ciprofloxacin, gentamicin, and rifampin. The isolate from the patient were resistant to erythromycin and susceptible to clindamycin, exhibited the M phenotype on the double-disk diffusion assay (D test), and harboured the msrAgene, encoding an efflux pump (23 Alvarez, 2006). In contrast, the first isolate was susceptible to both erythromycin and clindamycin and resistant to tetracycline (MIC >64 µg/mL). Because infections caused by CA-MRSA are associated with the presence of the lukF gene encoding the Panton-Valentine leukocidin toxin and the staphylococcal chromosome cassette mec (SCCmec type IV, which were evaluated by PCR (Alvarez, 2006) .The molecular epidemiology of healthcare related MRSA in Colombia has changed during the years but no reports of CA-MRSA had emerged. No risk factors associated with healthcare-associated MRSA were found in either of these patients, and the patients were not epidemiologically related (Alvarez, 2006).

URUGUAY

In Uruguay, MRSA strains are among the most prevalent nosocomial pathogens. Most MRSA strains isolated have been community associated cases (Ma X.X et al.,2005). CA-MRSA strains have been reported to differ in many characteristics such as susceptibility to antimicrobial drugs, types of staphylococcal cassette chromosome (SCC) mec element, and repertoires of exotoxin gene. In late 2001, a case was studied. An MRSA strain susceptible to other drugs was isolated. After that, paediatric infections associated with similar strains were observed (Ma X.X et al.,2005). Sporadic cases were followed by an epidemic increase of infections in the community, hospitals and jails. Non–multidrug-resistant MRSA infections were identified and a total of 125 S. aureus strains were resistant to oxacillin alone or to erythromycin from outpatients and inpatients(MaX.X et al.,2005).Susceptibilities to 8 antimicrobial drugs (oxacillin, vancomycin, gentamicin, rifampin, ciprofloxacin, erythromycin, clindamycin, and trimethoprim-sulfamethoxazole) were tested by the Kirby Bauer disk diffusion test , Production of PBP2´ and protein A were verified by MRSA Screen latex PBP2 and latex slide agglutination kits 24 respectively showed heterogeneity in the degree of resistance to oxacillin, since double halos or haze zones were observed around the disk containing 1 µg of oxacillin (Ma X.X et al.,2005).

RESEARCH AIM

The aim of this research was to conduct a systematic review of sensitivity patterns of staphylococcus aureus in South America.

OBJECTIVE

To carry out a systematic review of sensitivity patterns of S aureus to antibiotics in order to explore factors responsible for prevalence of staphylococcus infection.

Specific Objectives

1. To evaluate already existing antibiotics that S. aureus is susceptible and resistant to
2. To identify the factors that influences the resistance of S aureus sensitivity.
3. To assess the factors that influences the resistance of S aureus sensitivity

METHODOLOGY

In order to answer the aims and objectives of the research topic, secondary data was systematically reviewed. The databases used for attaining the information included PubMed, Google scholar. The utilization of the multiple databases presented the opportunity to gain accurate and reliable information that signified the primary aspects of the study. Also, the research study used the PRISMA tool for screening the research resources.

RESULTS

Identified studies were uploaded into endnote (Thomas Reuters) and duplicates were removed. 5 reviewers vetted through the study based on the topic and abstracts that met the inclusion criteria. Studies selected after the first screening were further screened through a detailed full text browsing, to further exclude studies that had some of the exclusion criteria. Out of 65 studies identified, 5 were excluded due to year of publication. Out of the 60 selected, 55 were further excluded due to unsatisfactory results and conclusion. Only 5 were finally used.

Fig 1.0 | Prisma Flow Chart

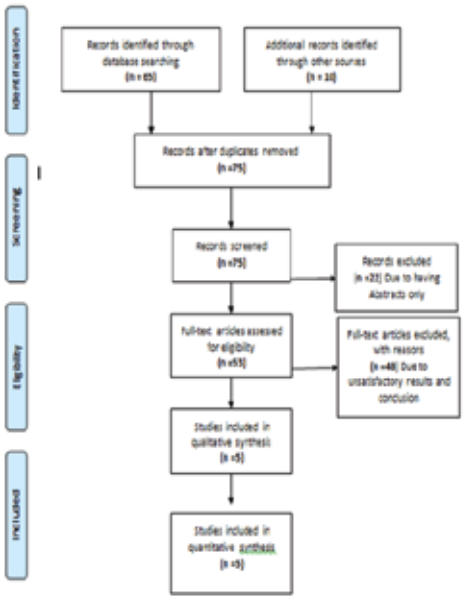
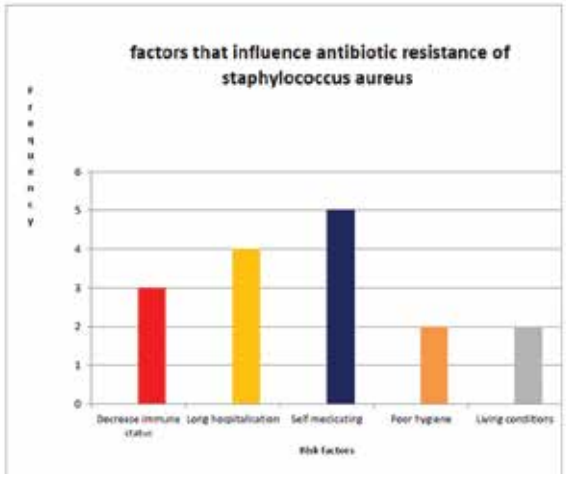


Fig 1.2| KEY RESULTS AND DISCUSSION



DATA ANALYSIS AND INTERPRETATION

Self-medicating

According to the 5 articles reviewed, self-medicating was the most common factor discussed. Self-medication with antibiotics constitute a major form of irrational use of medicine and can cause significant adverse effects such as resistance to microorganisms, treatment failures, drug toxicity, increase in treatment cost, prolonged hospitalization periods and increase in morbidity . In majority of economically deprived countries, nearly 60-80% of health related problems are treated through self-medicated as lower cost alternative. Self-medication particularly with antimicrobials is a phenomenon of increasing global relevance. The utilization of antibiotics without prescription is motivated by a complex set of factors, worth mentioning are unchecked sales, economic and time constrains, influence of family and friends, consumer attitudes and expectations and media campaigns. Now in many developing countries, antibiotics are easily accessible to everyone without a prescription, a phenomenon that is going to take a lot of efforts to control.

Long hospital stays

According to 4 articles out of 5, long hospital stay was mentioned to be the most appearing factor. The main reasons for keeping patients in the hospital despite absence of need for continued active treatment were unsuitability of the patient's home, reluctance of the family to accept the patient, and lack of other facilities and services such as institutions for long-term care of the sick, homelike institutions for those who need shelter and aid, and organized programs of home care.

Decrease immune system

According to 3 articles out of 5, decrease in immune system seemed to be the most stressed factor of interest. Opportunistic are infections that occur more often or are more severe in people with weakened immune systems than in people with healthy immune systems. People with weakened immune systems include people living with HIV. Due to weakened immune systems, pathogens develop resistance to antibiotics easily because there are no mechanisms of defense against diseases.

Living conditions

From the 5 articles reviewed, 2 emphasized most on living conditions as a factor that influence resistance to antimicrobials. Antibacterial agents have several routes of entry into the environment, such as sewage from the community or hospitals through manure and water bodies. The accumulation of antibacterial agents further selects resistant microorganisms, turning the environment into a gigantic reservoir for antibiotic resistance genes that feeds on the constant and increasing environmental pollution. Wastewater treatment plants have become hot spot for horizontal gene transfer and the coselection of genetic determinants providing resistance to antibiotics, pollutants, heavy metals, biocides, disinfectants, or detergents. The current legislation on water quality mainly focuses on the presence of indicator microorganisms but does not address the antibiotic concentrations of sewages and treatment plants. Strategies to mitigate the risks of environmental exposure should be aimed at improving industrial systems for sanitation and decontamination of hospital sewage water. Some studies suggest that living conditions are consistently associated with antibiotic resistance, after adjusting other significant predictors within a multivariable analysis. The living environment is composed of indoor living conditions (e.g. thermal com-fort) and outdoor conditions (e.g. air quality).For example, adverse health status may increase antibiotic use or healthcare utilization, and so increase the selection and transmission of antibiotic-resistant bacteria.

Hygiene

Hygiene was also mentioned in 2 articles out of 5.Like it had been discussed before that S.aureus is a human commensal,It is found in almost all the parts of the body.

Multiplication of the organism to other parts of the body could cause disease. Optimum hygiene must be practiced at all times to avoid contracting infections and diseases. Prepare food hygienically, following the five keys to safer food (keep clean, separate raw and cooked, cook thoroughly, keep food at safe temperatures, use safe water and raw materials) and choose foods that have been produced without the use of antibiotics for growth promotion or disease prevention in healthy animals.

CONCLUSION

Pharmacists should play a critical role in assisting people to make informed self-care choices because they are advisers to the public on everyday healthcare and are a key figure in the supply and delivery of medicines to the consumer. Hence the role of community pharmacists in self–medication needs to be encouraged and be promoted.

PUBLIC AWARENESS

Much work is needed on education of the consumer and the prescriber. To try to affect each of these factors can be overwhelming. Jumping from one course of action to another merely magnifies the overwhelming nature of the problem and its solution. But, by focusing on one action at a time, individuals and groups can move towards reversing the resistance phenomenon and ultimately succeed in the full control of resistance.

MEDICAL SURVEILLANCE

There‘s a need for firm control measures in antibiotics usage to prevent the dissemination of this multi resistant pathogen among individuals, work colleagues, family members, and consumers. Because many people have compromised immune systems, extra efforts are needed to prevent contamination with S. aureus strains. Curbing the inappropriate use of antimicrobial drugs is one of the best ways to prevent antibiotic resistance.
Medical surveillance of antibiotics on a continuous basis also is needed. The introduction of periodic in-service programs for antibiotic usage covering health education and food safety, hygiene even keeping the environment clean could raise the awareness of the personnel involved in the entire service sector. High rate of MRSA to currently recommended empiric antibiotics for soft skin tissue infections dictates the need for revising national guidelines and on-going prospective surveillance of Soft and Skin Tissue Infections in this setting.

References

World Health Organization, 2018. Antimicrobial resistance: global report on surveillance. World Health Organization.
Fletcher, S., 2015. Understanding the contribution of environmental factors in the spread of antimicrobial resistance. Environmental health and preventive medicine, 20(4), p.243.
.Abay, S.M. and Amelo, W., 2010. Assessment of Self-medication practices among medical, pharmacy, health science students in Gondar University, Ethiopia. Journal of Young Pharmacists, 2(3), pp.306-310.
Deyno, S., Fekadu, S. and Astatkie, A., 2017. Resistance of Staphylococcus aureus to antimicrobial agents in Ethiopia: a meta-analysis. Antimicrobial Resistance & Infection Control, 6(1), p.85.
Shittu, A.O. and Lin, J., 2006. Antimicrobial susceptibility patterns and characterization of clinical isolates of Staphylococcus aureus in KwaZulu-Natal province, South Africa. BMC Infectious diseases, 6(1), p.125
Abdulraheem, I., Adegboye, A. and Fatiregun, A., 2016. Self-medication with antibiotics: empirical evidence from a Nigerian rural population. Br J Pharm Res, 11(5), pp.1-3.
Ahmed, N.H. and Hussain, T., 2014. Antimicrobial susceptibility patterns of leading bacterial pathogens isolated from laboratory confirmed blood stream infections in a multi-specialty sanatorium. Journal of global infectious diseases, 6(4), p.141.
Alvarez, C.A., Barrientes, O.J., Leal, A.L., Contreras, G.A., Barrero, L., Rincon, S., Diaz, L., Vanegas, N. and Arias, C.A., 2006. Community-associated methicillin-resistant Staphylococcus aureus, Colombia. Emerging infectious diseases, 12(12), p.2000. 47
Bereket, W., Hemalatha, K., Getenet, B., Wondwossen, T., Solomon, A., Zeynudin, A. and Kannan, S., 2012. Update on bacterial nosocomial infections. Eur Rev Med Pharmacol Sci, 16(8), pp.1039-44.
Berger-Bächi, B. and Rohrer, S., 2002. Factors influencing methicillin resistance in staphylococci. Archives of microbiology, 178(3), pp.165-171.
Berger-Bächi, B., 1997. β-Lactam resistance. Médecine et Maladies Infectieuses, 27, pp.201-206.
Beyene, G. and Tsegaye, W., 2011. Bacterial uropathogens in urinary tract infection and antibiotic susceptibility pattern in jimma university specialized hospital, southwest ethiopia. Ethiopian journal of health sciences, 21(2), pp.141-146.
Boucher, H.W. and Corey, G.R., 2008. Epidemiology of methicillin-resistant Staphylococcus aureus. Clinical infectious diseases, 46(Supplement_5), pp.S344-S349.
Chambers H.F. and M. Sachdeva, 1990. Binding of $-lactam antibiotics to penicillin-binding proteins in methicillin-resistant Staphylococcus aureus . J. Infect. Dis.
Davies, J. and Davies, D., 2010. Origins and evolution of antibiotic resistance. Microbiol. Mol. Biol. Rev., 74(3), pp.417-433.
Dibah, S., M. Arzanlou, E. Jannati and R. Shapouri, 2014. Prevalence and antimicrobial resistance pattern of methicillin resistant Staphylococcus aureus (MRSA) strains isolated from clinical specimens in Ardabil, Iran. Iran J. Microbiol.,
Emmanuel Onwubiko Nwankwo1 and Magaji Sadiq Nasiru 2011Eticha, T. and Mesfin, K., 2014. Self-medication practices in Mekelle, Ethiopia. PLoS One, 9(5), p.e97464.
Fair, R.J. and Tor, Y., 2014. Antibiotics and bacterial resistance in the 21st century. Perspectives in medicinal chemistry, 6, pp.PMC-S14459. 48
Farajnia, S., Alikhani, M.Y., Ghotaslou, R., Naghili, B. and Nakhlband, A., 2009. Causative agents and antimicrobial susceptibilities of urinary tract infections in the northwest of Iran. International Journal of Infectious Diseases, 13(2), pp.140-144.
French, G.L., 2010. The continuing crisis in antibiotic resistance. International journal of antimicrobial agents, 36, pp.S3-S7.
Gebreyesus, A., Gebre-Selassie, S. and Mihert, A., 2013. Nasal and hand carriage rate of methicillin resistant Staphylococcus aureus (MRSA) among health care workers in Mekelle Hospital, North Ethiopia. Ethiopian medical journal, 51(1), pp.41-47.
Gootz, T.D., 2010. The global problem of antibiotic resistance. Critical Reviews™ in Immunology, 30(1).
Grigoryan, L., Burgerhof, J.G., Degener, J.E., Deschepper, R., Lundborg, C.S., Monnet, D.L., Scicluna, E.A., Birkin, J. and Haaijer-Ruskamp, F.M., 2008. Determinants of self-medication with antibiotics in Europe: the impact of beliefs, country wealth and the healthcare system. Journal of Antimicrobial Chemotherapy, 61(5), pp.1172-1179.
Holloway K. 2000. Antimicrobial resistance: the facts. Essential Drug Monitor WHO 28 & 29: 7–8
Japoni, A., Alborzi, A., Orafa, F., Rasouli, M. and Farshad, S., 2004. Distribution patterns of methicillin resistance genes (mecA) in Staphylococcus aureus isolated from clinical specimens. Iranian Biomedical Journal, 8(4), pp.173-178.
Kaspar, U., Kriegeskorte, A., Schubert, T., Peters, G., Rudack, C., Pieper, D.H., Wos-Oxley, M. and Becker, K., 2016. The culturome of the human nose habitats reveals individual bacterial fingerprint patterns. Environmental microbiology, 18(7), pp.2130-2142. 49

Cough or sneeze into your elbow

It keeps the virus off your hands, so you won't spread it to other people and make them sick too.

Find out more at
www.moh.gov.bw

against
COVID-19

RISK MANAGEMENT 05-08/2020

A SYSTEMATIC REVIEW OF FACTORS INFLUENCING PREVALANCE OF SEXUALLY TRANSMITTED INFECTIONS (STIs) IN AFRICA

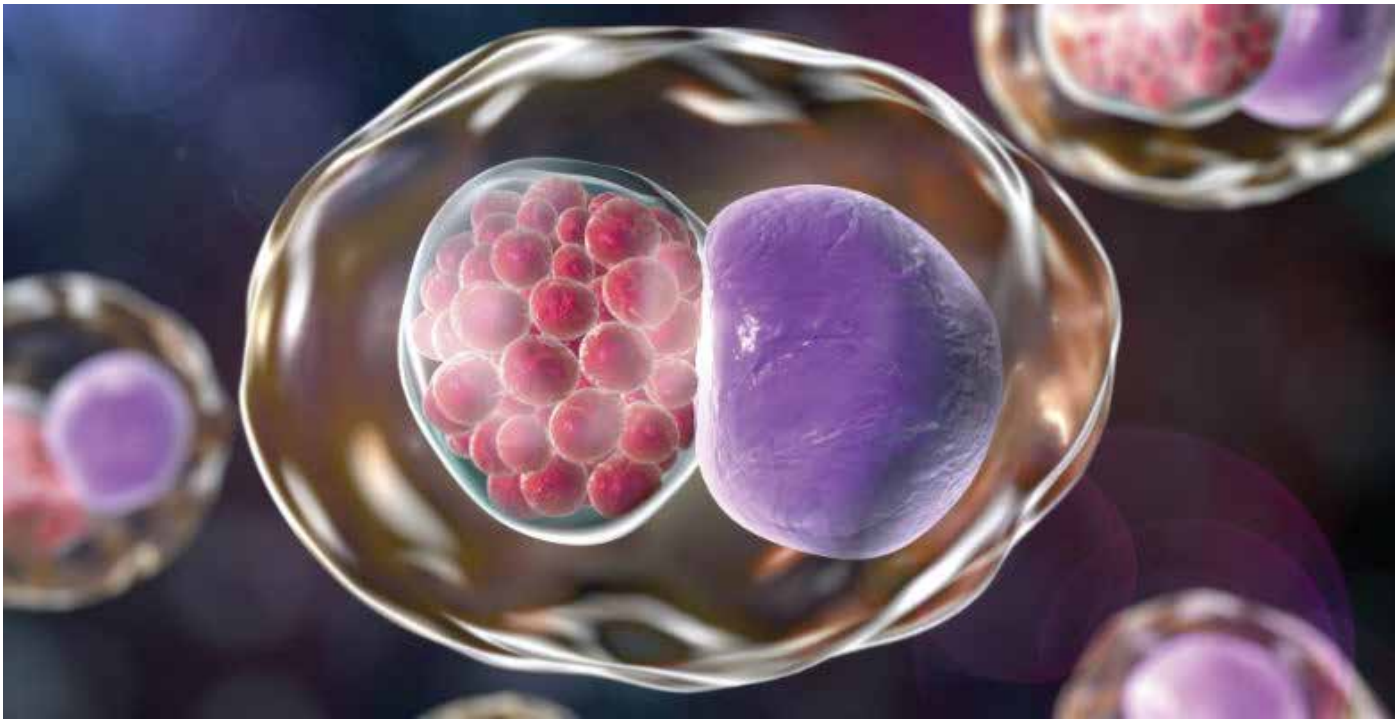
Author: Solomon Kolobe

1. Department for Medical Laboratory Science, DDT College of Medicine.

2. Department of Medicine, DDT College of Medicine.

Corresponding Author *Dr Derrick D.Tlhoiwe, Dr Tumelo Tlhoiwe, Larry.L. Mweetwa*
Email: *enquiries@ddtcollegeofmedicine.com*

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935



Abstract |

Prevalence and incidence rate of sexually transmitted infections (STIs) remains unacceptably high, as they cause high global morbidity and mortality. As result, Africa is estimated to have high prevalence rate of STIs due, to poor health systems, lack of education, gender inequality and poverty caused by large external debts of states or developing countries. The major cause of high prevalence rate of STIs, is associated with risky behaviour, sex workers, Men Who Have Sex with Men, practising unprotected sex and intravenous drug pushers. The World Health Organisation (WHO) has categorized sexually transmitted pathogens into two, namely, bacterial and viral STIs. If left untreated, STIs may result into serious complications. Sexually transmitted pathogens have now developed antimicrobial resistance and have forced the African Union to provide more money in order to develop new drugs.

Key words | Sexually Transmitted Infections

Background

Sexually Transmitted Diseases (STDs) are a variety of clinical syndromes and infections transmitted predominantly by various pathogens and can be acquired or transmitted through sexual activity (Samarawickrema et al., 2014). Despite minor fluctuations, the incidence remains unacceptably high and cause global morbidity and mortality resulting in decline of quality of life in terms of social, religious and economic levels. (Meheus 2010). High prevalence rate of STIs is influenced by several factors such as, risky behaviour, sex workers, men who have sex with men and intravenous drug pushers (Sonnenberg et al., 2013). Viral STIs including HIV, Human Papillomavirus (HPV), Herpes genitalis and Genital warts are incurable and deadly while some bacterial STIs like Chlamydia, Gonorrhoea, Syphilis and Chanchroid, are curable. Candidiasis and Trichomoniasis are curable too if detected and treated. STIs increase the risk of Human Immunodeficiency Virus (HIV) infection and transmission (Kim et al., 2015).

Some Chlamydia trachomatis and Neisseria gonorrhoea, are common causes of asymptomatic infections that negatively affect the economy of different regions of the world, although they are harmful and curable through the provision of antibiotics (CDC, 2014). When the infection is left untreated, complications can result into, infertility, epididymitis and urethral stricture in men while in women the infection can cause pelvic inflammatory disease, salpingitis and infertility. In pregnant women complications include premature delivery, neonatal morbidity, congenital infections and perinatal infections (Herbst de Cortina et al., 2016).

Since there is a global rise of Sexually Transmitted Diseases among individuals of different age groups, this may indicate that Africa is not an exception. According to AVERT, 2018, poor health systems, lack of education, gender inequality and poverty caused by large external debts of states or developing countries resulted in the increase of STIs cases. Diagnostic technology in developing countries, has caused an improvement towards health management as they have moved from traditional system to molecular diagnostics which is more accurate and produce reliable results (Workowski et al., 2011). Although STIs are treated with a standardized drug regimen following a syndromic approach, this has resulted into drug resistance in some cases (Trollope-Kumar and Guyatt 2006).

In 2016 CDC carried out a study in the United States of America which showed a total of 1,598,354 cases of Chlamydia trachomatis with 9.2% of these cases being individuals between 15–19 years and 8.0% aged between 20–24 years. Gonorrhoea was reported to have increased from 4.7% in 2015 to 17.5 in 2016 while in males it was 22.2% and females 13.8%. From 2012 to 2016, Syphilis rates increased in men by 14.7% and 35.7% in women (Cdc.gov, 2018). By the year 2008, African region recorded 9% for Chlamydia, 22.8% for Gonorrhoea and 3.8 for syphilis while Europe region recorded 44.0% for Chlamydia, 7.3% for Gonorrhoea and 0.4% for syphilis (Toskin 2014). From this statistical analysis it shows that Europe and USA has high exposure towards STIs rather than Africa with a deficient data.

Sexually Transmitted Infections has set a high global concern, which has a negative impact on health and socio-economic aspects of the affected population groups despite new diagnostic methods, intervention methods and prevention strategies being put in place. In 2019, the world prevalence rate of STIs was 376 million compared to 357.4 million recorded in 2012 (WHO, 2019). Among these statistics, the African region recorded 115 million compared to Europe with 19.5 million, 14 million for North America and Asia with 158 million. (WHO, 2019).

The need to identify factors that fuel the spread of STIs to the levels, is indicated. These factors may not be exclusive to some continents. In addition, some African countries do not test all STIs thus lead to morbidity toward its population. This leads to the African health sectors to fail to provide treatment equitably due to concentration in mostly affected areas only. (Wi.T et al., 2017). There is currently limited information and ignorance of risk factors associated with STIs at population level in Africa.

RESEARCH AIM

The aim of this research was to conduct a systematic review of factors influencing the prevalence of Sexual Transmitted Infections in Africa.

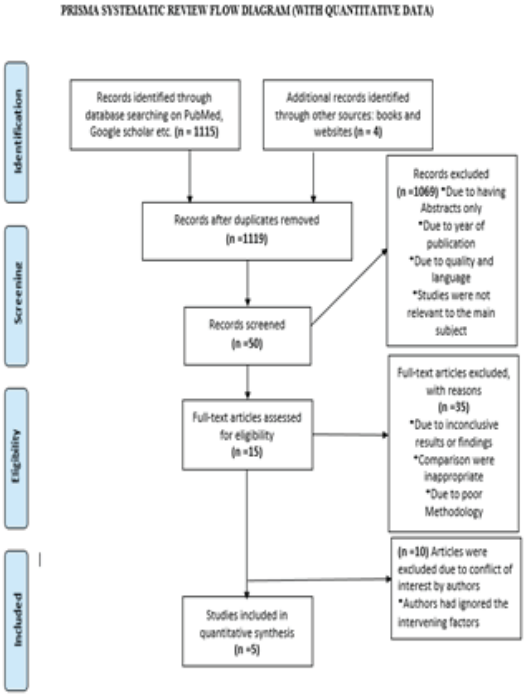
OBJECTIVE

1. To identify factors that influence the spread of STIs.
2. To evaluate the factors that influence the spread of STIs.

METHODOLOGY

The systematic review was adopted to conduct this study, with accordance to PRISMA guidelines used to select published articles on STIs. The study elaborated the factors influencing prevalence of Sexually Transmitted Infection. The selected study design was a remarkable tool which was used to accomplish the purpose of the study based on the study objectives, data analysis and results. Furthermore, this study design indicates how data was collected and analysed without jeopardizing the integrity of results. The academically credible search engines used to find relevant information about the topic were Google scholar, EMBASE, SCOPUS, ELSEVIER, NCBI, SCI-HUB and PUBMED databases.

Fig 1.0 | Prisma Flow Chart



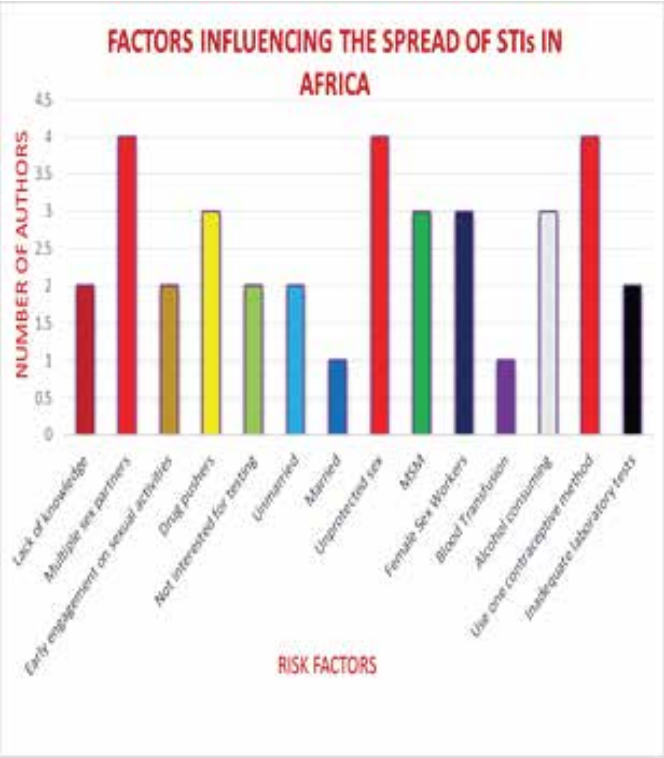
The source above is adopted from Check, J and Schutt, R.K, (2011).

RESULTS

Articles were selected using the duplicate method and random selection of articles in order to separate relevant articles from non-relevant ones. The PRISMA flow chart was used to show the patterns in which the researcher selected relevant information based on the published study, to be used in this study. Data from each article was extracted using a pre-defined set of variables; study characteristics, type of participants, influential factors, study population size, geographical region and the period of the study conduction. Moreover, data abstraction was conducted with no consideration of researcher qualifications or expertise.

Out of 1119 studies identified, 1069 were excluded due to having abstracts only, poor quality and language, and year of publication. 15 were selected as eligible articles and 35 were further excluded due to inconclusive results and poor methodology. Only 5 were finally used.

Fig 1.2 Factors influencing the spread of STIs in Africa



RESULTS ANALYSIS AND INTERPRETATION

Men Who Have Sex with Men (MSM)

The expression of Men Who Have Sex with Men is an umbrella term that encompasses different realities all over the world and in Africa where a diversity of same-sex expressions and sexual networks has flourished, despite stigmatisation and repression of homosexuality (Keshinro et al., 2016). 'Gay' or 'homosexuality', these terms are relatively modern inventions. They did not exist in the middle ages. Instead, medieval writers used the term 'sodomy' to cover a multitude of what was considered to be a 'sins' (Pramanick 2014).

However, bisexuality remains relatively common alongside concurrent relationships with girlfriends or wives as it is unclear whether they maintain relationships with women to uphold social relationships or because these men identify as heterosexual or bisexual (Rebe et al., 2015). Hence from this study, four authors agreed that MSM is one of the rising factors that is ignored and discriminated by government laws, cultural aspects and religious believes while it is still practised. To conduct this kind of study regarding the subject is difficult because Africa has cultural and religious believers who does not accommodate such views. According to Müller et al., (2016) African countries share a social environment generally bound by cultural norms that are hostile toward sexual minorities. Although significant differences exist between countries are laws relating to homosexuality and how they are applied and interpreted influence the spread of STIs in this minority group. Societal attitudes towards same-sex relationships has varied over time and place. The cultural aspects are influenced by religious laws which had established sodomy as a transgression against divine law and seen as crime against the nature. The condemnation of anal sex between males, predates Christian's belief. The Majority of Africans are Christians and Muslims and both religious groupings prohibit same-sex practise and Muslims recommend death penalty to homosexuals (Ross et al., 2014). However, the study have shown that MSM correlates with other risk behaviour such as multiple partners, unprotected sex, practising sexual activities under the influence of alcohol and drug misuse resulting in high prevalence of STIs. There is a need to develop STIs and HIV prevention, care and treatment programs that are appropriate for this population and provision of education for MSM on different types of interventions methods.

Use of one Method of Contraceptive, Multiple Sex Partners and Unprotected Sex

Tahir, et al., (2017) has revealed that 35.4% of participants had multiple sex partners, 51% occasionally using condom and 73.9 % of women use at least one contraception method, which is not proven to be 100% effective. Four studies from this thesis agree with other authors that unprotected sex, multiple sex partner and use of one prevention method have high risk of spreading STIs and HIV among Africans without considering other prevention methods. Although cultural and religious aspects have influenced Africans to believe in reproduction as source of power in the family and hindering it, is killing one`s new life and is against God's wish. (Filemban et al., 2015). Furthermore, women use condoms less consistently than men, this increases their vulnerability to STI including HIV and unintended pregnancies (Musyoki et al., 2014). Most of times, condoms failure is considered to be behavioural rather than mechanical (breakage or slippage) because of lack of knowledge on how to use them properly. The Majority of African countries practise polygamy and this has been adopted from a cultural values and religious beliefs, especially among Muslims.

Alcohol, Drug Pushers and Female Sex Workers (FSW)

Alcohol and drug use in the context of commercial sex is prevalent and potentially harmful among FSWs and their clients (Kim et al., 2015). Uganda conducted a survey in 2008 and 2009 regarding consumption of alcohol every day recorded at 17.9% and 43.8% once a week whereas 47.2% reported alcohol use before sex and 29.5% exchanged sex for money (Kim et al., 2015). Hence alcohol and drug use is positively associated with adverse physical health, illicit drug use, mental health problems, unprotected sex and victimization of sexual violence in high-income countries (Keshinro et al., 2016). All these increase

the spread of STIs including HIV. In addition, commercial sex work has a negative impact on the lives of women as they are exposed to STIs and HIV infection. Women engage in commercial sex work because of lack of employment and the need to lead a modern life style and for pleasure. Furthermore, these changes force them to use alcohol and illicit drugs to cope with the numerous and constant stress, to disinhibit or form an 'excuse' for sex work while male clients use alcohol as an enhancer for sexual performance. 50 to 60% commercial sex workers are at a high-risk of being exposed to STIs whereas condom usage is low among this population (Otieno et al., 2014).

Majority of women (82.2 %) use sex work as their main source of income and almost two-thirds (62.6 %) use a condom consistently with their paying clients and 38.6 % consistently use a condom with their non-paying partner. Less than 20 % reported never consuming alcohol however, 33.4 % reported consuming alcohol 4 or more times per week (Musyoki et al., 2014). Screening and intervening for alcohol misuse must be conducted in multiple settings such as clinics, emergency room, social service agency and community programs.

Early Engagement in Sexual Activates, Married and Unmarried

Nowadays, developed countries in Africa has high prevalence rate of sexually transmitted infections due to early engagement of adolescences on sexual activities (Abdul et al., 2018). Two studies have shown that early sexual activity is one of the risk factors. Kenya conducted a study enrolling student's aged 15- 24 year. The purpose off the study was to promote condom use as an essential effort to slow the spread of HIV and STIs. 66.2% of the participants had experienced sexual intercourse whereas 72.8 % used condoms. 62.3% of students had multiple partners of the same gender while others practised sex under the influence of toxic substances without the use of condom and few participated in sex for money (Kithuka et al., 2011).

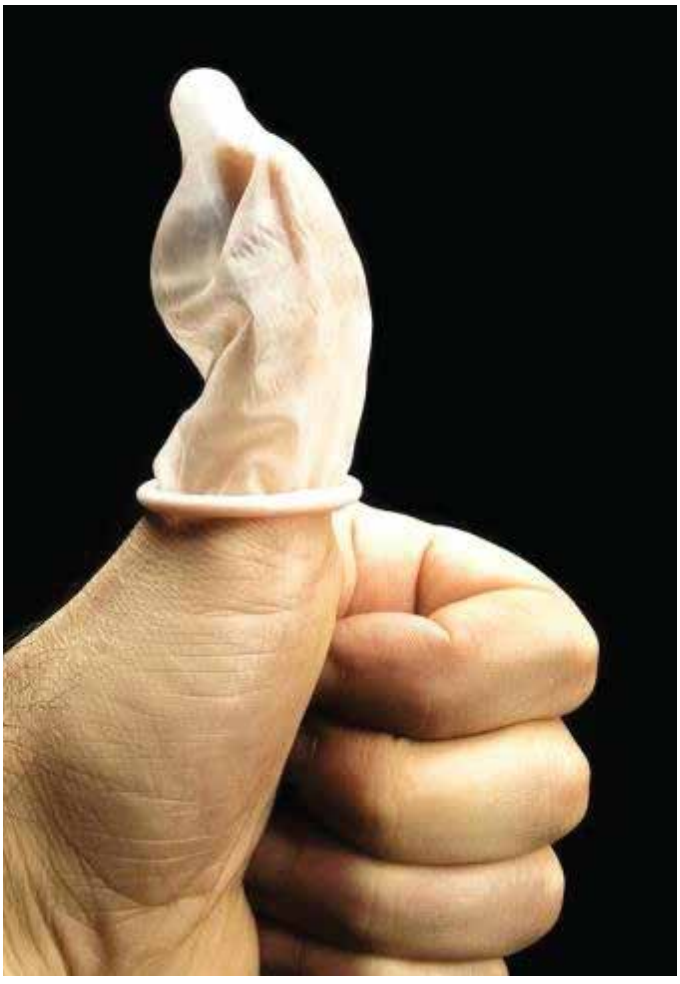
Arguments have been raised between two factors which are inconclusive, as two studies have revealed that unmarried couples tend to have multiple sex partners and practise commercial sex, this results in the spread of STIs including HIV. From other sources, the recommended title 'married couple' shown to have no or low prevalence of sexually transmitted infections because cultural and religious aspects guide the two parties not indulge in unfaithful activities. However, the findings of this study, have shown that the spread of STIs by married couples is caused by loss of sexual interest between one another and cheating as 'sugar daddy or mummy' to the youth.

Lack of Knowledge, Inadequate Laboratory Testing and Blood Transfusion

Some African countries are affected by civil wars and non-curable infections such as Ebola, these force affected countries to focus on the major problem rather than curable infections. Hence there is lack of updated information regarding risk factors associated with the spread of STIs and were more prevalent among the less or non-educated people (Musyoki et al., 2014). The economy and the health sector of developing countries have failed to provide better laboratory tests which has resulted into high prevalence rates and loss of laboratory service users. Currently blood units are tested for Sexually Transmitted Infections (TTIs) which include HIV, to prevent the spread. According to Filemban et al., (2016), Studies have revealed that blood transfusion is a risk factor as there were inadequate laboratory tests and testing services in poor or developing countries of Africa.

CONCLUSION

Findings of this study indicates a high STI burden influenced by Men Who Have Sex with Men (MSM), Female Sex Workers (FSW), multiple sex partners, unprotected sex, use of one method of contraceptive, alcohol consumption, drug pushers, early engagement in sexual activates, married, unmarried, lack of knowledge, inadequate laboratory testing, Blood Transfusion and they negatively affected the African economy. Leading pathogens identified from the study are HPV, Syphilis, Gonorrhoea, Chlamydia, Trichomonias, HSV and HIV. African countries should provide free access to condoms in hospitals, public and school areas, Implement laws that are gender equal to appreciate homosexuality and provision of education in public areas.



References

REFERENCES

Abdul, R., Gerritsen, A., Mwangome, M. and Geubbels, E. (2018). Prevalence of self-reported symptoms of sexually transmitted infections, knowledge and sexual behaviour among youth in semi-rural Tanzania in the period of adolescent friendly health services strategy implementation. BMC Infectious Diseases, 18(1).

AVERT. (2018). HIV and AIDS in Botswana. [Online] Available at: https://www.avert.org/professionals/hiv-around-world/sub-saharan-africa/botswana [Accessed 31 Oct. 2018].

Centers for Disease Control and Prevention, (2014). Recommendations for the laboratory-based detection of Chlamydia trachomatis and Neisseria gonorrhoeae-2014. MMWR. Recommendations and reports: Morbidity and mortality weekly report. Recommendations and reports, 63(RR-02), p.1.

Centers for Disease Control and Prevention, (2016). Sexually Transmitted Infections. Galveston: NCBI.Cdc.gov. (2016). [online] Available at: https://www.cdc.gov/std/stats16/CDC_2016_STDS_Report for 528Web Jun 08_2015_1644.pdf [Accessed 10 Aug. 2016].

Centers for Disease Control and Prevention, (2018). Sexually Transmitted Infections. Galveston: NCBI.Cdc.gov. (2018). [online] Available at: https://www.cdc.gov/std/stats16/CDC_2016_STDS_Report for 508Web Sep21_2017_1644.pdf [Accessed 6 Nov. 2018].

Filemban, S., Yasein, Y., Abdalla, M., Al-Hakeem, R., Al-Tawfiq, J. and Memish, Z. (2015). Prevalence and behavioral risk factors for STIs/HIV among attendees of the Ministry of Health hospitals in Saudi Arabia. The Journal of Infection in Developing Countries, 9(04), pp.402-408.

Herbst de Cortina, S., Bristow, C., Joseph Davey, D. and Klausner, J. (2016). A Systematic Review of Point of Care Testing for Chlamydia trachomatis, Neisseria gonorrhoea, and Trichomonas vaginalis. Infectious Diseases in Obstetrics and Gynecology, 2016, pp.1-17.

Keshinro, B., Crowell, T., Nowak, R., Adebajo, S., Peel, S., Gaydos, C., Rodriguez-Hart, C., Baral, S., Walsh, M., Njoku, O., Odeyemi, S., Ngo-Ndomb, T., Blattner, W., Robb, M., Charurat, M. and Ake, J. (2016). High prevalence of HIV, chlamydia and gonorrhoea among Men Who Have Sex with Men and transgender women attending trusted community centres in Abuja and Lagos, Nigeria. Journal of the International AIDS Society, 19(1), p.21270.

Kim, E., Hladik, W., Barker, J., Lubwama, G., Sendagala, S., Ssenkusu, J., Opio, A. and Serwadda, D. (2015). Sexually Transmitted Infections associated with alcohol use and HIV infection among Men Who Have Sex with Men in Kampala, Uganda. Sexually Transmitted Infections, 92(3), pp.240-245.

Kithuka, N., Ng'ang'a, Z., Mwangi, M. and Wanzala, P., (2011). KAP factors associated with condom use among undergraduate Students of a Public University in Kenya (A case of Jomo Kenyatta University of Agriculture and Technology). African Journal of Health Sciences, 19(3-4), pp.45-5.

Kriesel, J., Bhatia, A., Barrus, C., Vaughn, M., Gardner, J. and Crisp, R. (2016). Multiplex PCR testing for nine different Sexually Transmitted Infections. International Journal of STD & AIDS, 27(14), pp.1275-1282.

Meheus, A. (2010). Epidemiology and control of sexually transmitted diseases:

Müller, E., Rebe, K., Chirwa, T., Struthers, H., McIntyre, J. and Lewis, D. (2016). The prevalence of human papillomavirus infections and associated risk factors in Men-Who-have-Sex-with-Men in Cape Town, South Africa. BMC Infectious Diseases, 16(1).

Musyoki, H., Kellogg, T., Geibel, S., Muraguri, N., Okal, J., Tun, W., Fisher Raymond, H., Dadabhai, S., Sheehy, M. and Kim, A. (2014). Prevalence of HIV, Sexually Transmitted Infections, and Risk Behaviours among Female Sex Workers in Nairobi, Kenya: Results of a Respondent Driven Sampling Study. AIDS and Behavior, 19(S1), pp.46-58.

Otieno, F., Ndivo, R., Oswago, S., Pals, S., Chen, R., Thomas, T., Kunneke, E., Mills, L. and McLellan-Lemal, E. (2014). Correlates of prevalent Sexually Transmitted Infections among participants screened for an HIV incidence cohort study in Kisumu, Kenya. International Journal of STD & AIDS, 26(4), pp.225-237.

Pramanick, A. (2014). Marlowe's Presentation of Edward the Second as a Homosexual Text. IOSR Journal of Humanities and Social Science, 19(11), pp.12-17.

Rebe, K., Lewis, D., Myer, L., de Swardt, G., Struthers, H., Kamkuemah, M. and McIntyre, J. (2015). A Cross Sectional Analysis of Gonococcal and Chlamydial Infections among Men-Who-Have-Sex-with-Men in Cape Town, South Africa. PLOS ONE, 10(9), p.e0138315.

Ross, M., Nyoni, J., Ahaneku, H., Mbwambo, J., McClelland, R. and McCurdy, S. (2014). High HIV seroprevalence, rectal STIs and risky sexual behaviour in men who have sex with men in Dar es Salaam and Tanga, Tanzania. BMJ Open, 4(8), pp.e006175-e006175.

Samarawickrema, N. et al., (2014). Prevalence of Trichomonas vaginalis, Chlamydia trachomatis, Neisseria gonorrhoea and Human Papillomavirus in a sexual health clinic setting in urban Sri Lanka. International Journal of STD & AIDS, pp. 1-7.

Sonnenberg, P., Clifton, S., Beddows, S., Field, N., Soldan, K., Tanton, C., Mercer, C., da Silva, F., Alexander, S., Copas, A., Phelps, A., Erens, B., Prah, P., Macdowall, W., Wellings, K., Ison, C. and Johnson, A. (2013). Prevalence, risk factors, and uptake of interventions for sexually transmitted infections in Britain: findings from the National Surveys of Sexual Attitudes and Lifestyles (Natsal). The Lancet, 382(9907), pp.1795-1806.

Tahir, D. F., Zubier, F. & Pusponegoro, E. H., (2017). Positivity proportion of chlamydia trachomatis and neisseria gonorrhoeae with leukocyte esterasetest and pcr technique in men who have sex with men. International Union Against Sexually Transmitted Infections, Issue 16, p. 40.

Toskin, I., (2014). Principles and Practice of Sexually Transmitted Infections. Epidemiology of STIs: factors, numbers and surveillance, p. 19.

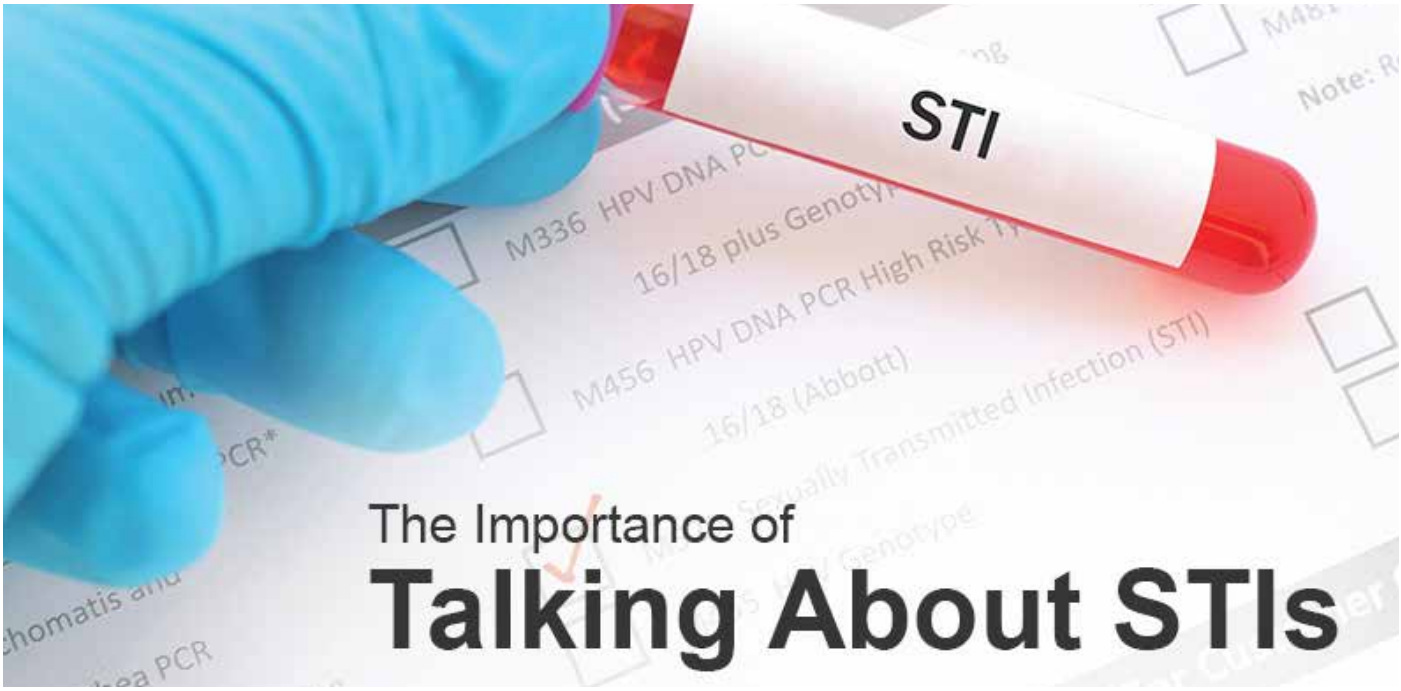
Wi T, Lahra MM, Ndowa F, Bala M, Dillon J-AR, Ramon-Pardo P, et al. (2017) Antimicrobial resistance in Neisseria gonorrhoea: Global surveillance and a call for international collaborative action. PLoSone Med 14(7): e1002344. https://doi.org/10.1371/journal.pmed.1002344.

Workowski, K.A. and Berman, S.M., (2011). Centers for Disease Control and Prevention sexually transmitted disease treatment guidelines. Clinical infectious diseases, 53(suppl_3), pp.S59-S63.

World Health Organization, 2019. Global prevalence and incidence of sexually transmitted infections: overview and estimates (No. WHO/CDS/CSR/EDC/2019.10). Geneva: World Health Organization.

Wynn, A., Moucheraud, C., Moshashane, N., Offorjebe, O., Ramogola-Masire, D., Klausner, J. and Morroni, C. (2019). Using partner notification to address curable sexually transmitted infections in a high HIV prevalence context: a qualitative study about partner notification in Botswana. BMC Public Health, 19(S1).

Yin, Y., Wu, Z., Lin, C., Guan, J., wen, Y., Li, L., Detels, R. and Rotheram-Borus, M. (2008). Syndromic and laboratory diagnosis of sexually transmitted infection: a comparative study in China. International Journal of STD & AIDS, 19(6), pp.381-384.



AFRICA'S LARGEST MARKET; EMPOWERING CITIZENS

ANACONDA

'AFRICA'S LARGEST MARKET, EMPOWERING CITIZENS'

As Simple as ABC

Website: www.anacondastore.com
Email : info@anacondastore.com
Cell: +267 7373 7373
Phone: +267 393 7373

A Systematic Review of the Role of Physiotherapy Interventions in Palliative Care

Author: : Dr L. Phokontsi, Dr L. Mweetwa, Dr T. Tlhoiwe, Muya, C.K.; Mudawarima, T. Silumesii, L. Chisenge

1. Department of Physiotherapy and rehabilitation Sciences
2. Department of Pharmacy and Pharmaceutical Sciences

Email: *journals@ddtcollegeogofmedicine.com*

DDT College of Medicine,
P.O. Box 70587, Gaborone Botswana
Tel: +267(0)3904924/5
Cell: +267(0) 7710000
Fax: +267(0)3904935

Abstract

The aim of this research is to conduct a systematic review analysing the role of the physiotherapy interventions in palliative care. PRISMA as a critical appraisal tool was utilised for the selection of the research articles. The inclusion criteria were based on the year of publication, ease of availability, language, geographical location, and study type. To ensure the credibility, databases such as Elsevier, Proquest, and EBSCO Host were used to filter the grey content. Data published in the past ten years (2009-onwards) was only included to ensure the selection of the most recent interventions used by the physiotherapists. A total of 11 articles were selected which determined that physiotherapy interventions involving breathing exercises, aerobic exercises, manual therapies, and educational awareness were critical to promoting the functional capability and empower the patients.

Keywords: Physiotherapist, Palliative Care, Physical Therapy, End-of-Life Care, Non-pharmacological Intervention

Background

World Health Organisation (WHO) defined palliative care as the approach which enhances the quality of life of the patients who are encountered with life-threatening diseases through the management and relief from the suffering through early intervention, impeccable evaluation, and treatment of pain and other associated issues [1]. Patients in palliative care experience a greater level of functional incapability and disability as a result of disease progression, direct local and systematic impacts, and deconditioning pain. Impairment in physical functioning is a predominant contributor to a significant decline in the quality of life of such patients. Palliative care patients expressed a high desire to stay physically active during the course of the disease while sustaining and retaining physical independence [2]. Thus, the notion of rehabilitation in palliative care Spatients is to promote adequate treatment provided with the objective to eradicate disability through optimising the functional status, independence, autonomy, and standard of living.

The World Confederation for the Physical Therapy has defined physical therapy or physiotherapy as the provision of services to the people for the development, maintaining, and restoring the maximum mobility as well as functional capability throughout the entire life-span [3]. Physiotherapy, in particular, encompasses the services in situations where the function and the movement are threatened by the ageing process or due to any injury/disease [4]. Physiotherapists form an integral component of the multidisciplinary team (MDT) in the palliative care by focusing on the processes and procedures for enhancing the function and quality of life through multivariate care dimensions [5]. Of these care dimensions, the physical dimension in the palliative care treatment and management is linked to symptom control, improving the flexibility, mobility, endurance, deformity, gait, balance, co-ordination, deformity, energy expenditure, and exercise tolerance along with maintaining adequate breathing. The functional dimensions, on the other hand, are related to improving the daily activities and functions that include the sensorimotor performance [6]. Physiotherapists aim to improve the successful performance of the complicated physical functional activities such as housekeeping and maintaining personal hygiene which requires the involvement of the affective and cognitive abilities.

The integration of physiotherapists into the palliative care plan is a relatively new concept despite the fact that the physiotherapy interventions in palliative management were identified during the early 1960s [1]. The primary objective of including a rehabilitation approach while treating the palliative care patients is through goal setting to enhance the functional ability while subsequently reducing the disease consequences as long as possible [7]. The ultimate goal of the physiotherapist is to promote independence as much as possible to ensure the accomplishment of important activities to ease the end-stage life of the people. However, in cases where improving the functional ability is not possible, physiotherapy intervention is to promote the patient as well as the ability of the carer to cope with the deteriorating condition of the patient through awareness and education to improve the quality of life [8]. Therefore, the overall aim of the physiotherapist is to facilitate the patient to reach the best possible quality of living for the remaining patient's life.

Methodology

Research Design

The research design for this study has been based on the systematic review of the literature to determine the interventions of physiotherapists in palliative care. Through a systematic review, the selection of the appropriate data sources enabled the researcher in collecting pertinent, credible, and reliable information through the use of databases for the selection of peer-reviewed journal articles [9]. Provided the nature and phenomenon of the research topic, systematic qualitative review of literature is optimal as it enables in determining the interventions of physiotherapists from previous authenticated researches without the involvement of any statistical testing as no variables are involved in this research.

Search Strategy

The search strategy for the attainment of the most desirable information comprised on the use of the keywords "Physiotherapy", "Physiotherapist" "Physiotherapy interventions", and "Palliative care" alone as well as in combination with the utilisation of the Boolean Operators "AND" and "OR". The Boolean Operators were incorporated into the search strategy of the most reliable, authenticated, and prominent databases in the field of health sciences which included Elsevier, ProQuest and EBSCO Host. Here, it is important to signify that the entire research was constituted using the widely used and openly accessed databases to ensure the reproducibility and credibility of the literature.

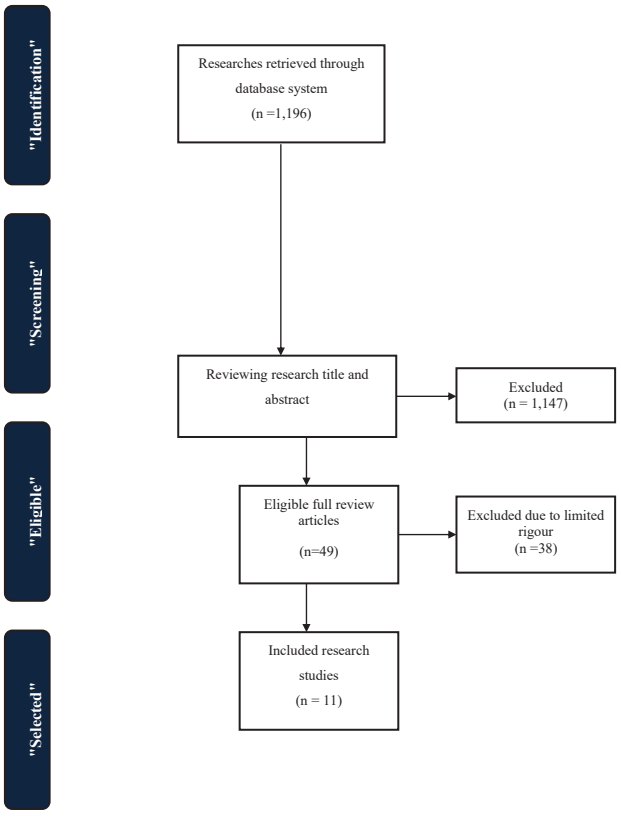
Data Extraction

The criterion for the extraction of data was based on the inclusion versus the exclusion criteria. The inclusion criteria facilitate in setting the boundaries and restrictions for collecting the most viable, authenticated, and reliable information [10]. Different approaches for the inclusion criteria which had been specified for this research included the language, publication year, study type, geographical aspects, design of the research, and the interest exposure. In the regard, through the use of the inclusion criteria, the researches which had been published in the English language only were opted while literature in a language other than English was excluded. In a similar manner, the research studies which had been published in the last ten years were selected for this study to ensure the inclusion of the most updated and relevant context. Thus, literature published before 2009 was excluded from the selection.

Selection of the Study

The selection of the study in the systematic approach is regarded as the critical appraisal which ensures the value and trustworthiness of the study. Critical appraisal is commonly regarded as the implications of the values and rules that predominantly assist in the evaluation of the resulting viability, method, and procedures while adhering to the ethics. Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) are used for the assessment of the critical appraisal tool for determining the validity and reliability of the data collection [11]. PRISMA promotes in easy filtration of the research articles to comply with the standards of the quality. Thestep-by-step assessment of the PRISMA to determine the physiotherapy intervention in palliative care is illustrated in the following figure below

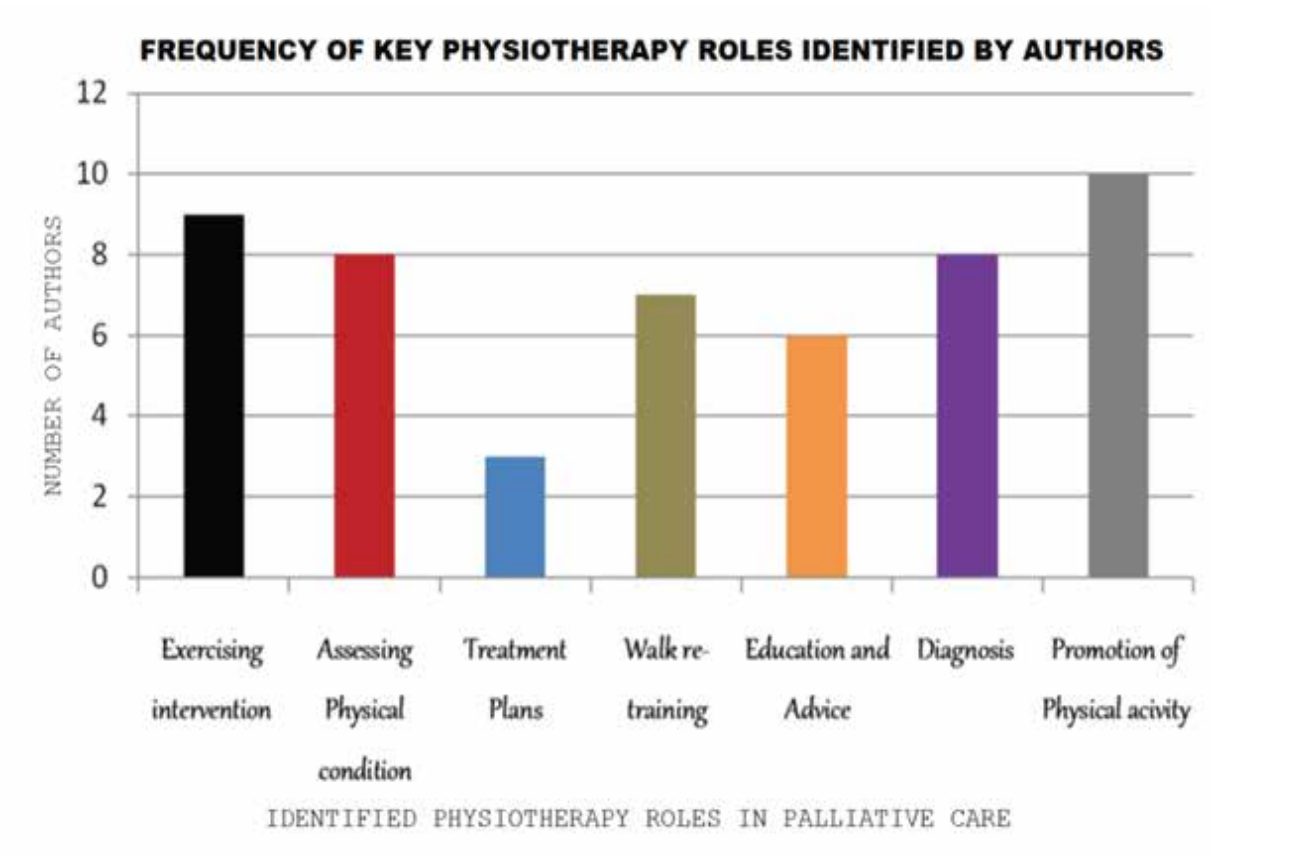
5



Author	Year	Country	Methodology	Key Findings
Hegarty et al.	2016	Ireland	Cross-sectional Study	The key findings indicated that physiotherapy induced palliative exercising interventions in patients suffering from Parkinson's disease improved the strength of the lower limbs. The physiotherapist intervention specifically deduced that palliative exercising could serve as a potential modification for the accomplishment of clinically relevant results in the walking ability of the patients.
Lim and Ng	2015	Singapore	Mixed methodology	It was determined that improving the knowledge and skills of the physiotherapists through perception and knowledge in the palliative care domain could predominantly assist in analysing the challenges in acute hospital settings. Good palliative care is dependent on effective communication, education and advice, so physiotherapist intervention is based on developing communication skills to improve technical competencies.
Möller et al.	2016	Sweden	Pilot Study	Physiotherapist interventions in palliative care settings were determined through multiple therapeutic mechanisms focused on patient-centric needs, good diagnosis, promotion of physical activity, treatment plans. The pilot study determined that a better-nuanced investigation of the clinical complications could facilitate in the optimisation, clarification, and development of physiotherapy interventions.
Jensen et al.	2014	Germany	Retrospective, Descriptive Study	The key analysis indicated that physical exercise in advanced cancer patients had a beneficial impact on the mobility and functional ability with respect to the disease-related and socio-demographic aspects. Physiotherapeutic intervention including the relaxation and the breathing therapies improved the quality of living of terminally ill patients.
Przedborska et al.	2015	Poland	Quantitative Method	The findings indicated that though physiotherapy interventions did not exhibit a statistically significant relationship in enhancing the self-care and mobility of the

				patients in palliative care, however, prominent results were recorded in the management of the depression, anxiety, and intensity of dyspnea after the physiotherapy program. Walk retraining, education and advice on health as well promotion of physical activity.
Morrow et al.	2017	South Africa	Cross-sectional Descriptive Survey	Despite inadequate training, knowledge, and required skillsets, a large number of physiotherapists were able to manage the critical requirements of the patients during palliative care and thus proper inclusion of the palliative care knowledge in the graduate program could yield better and positive outcomes for optimising the individual functional capability.
Saher et al.	2018	India	Randomised Clinical Trial Retrospective Study	The final outcomes indicated that physiotherapists led interventions improved the functional capability while offering relief from the symptoms to the patients in palliative care. This signified the notion that physiotherapists in caring of patients could enhance the independence and quality of living during end-stage of life.
Cullum	2019	United Kingdom	Qualitative Semi-structured Interviews	Within the inpatient settings, rehabilitative palliative care has become a challenge for the inpatient hospice unit and physiotherapist could play an integral role in eradicating the barriers through effective communication and rehabilitative palliative care practices while improving the confidence and autonomy of the patients.
Wilson and Briggs	2017	United States of America	Review Article	Lack of the consistent integration of the physiotherapist within the hospital settings is constituted as a barrier in the provision of non-opioid alternatives for the management during the palliative care. Physical therapy supports pain management by improving the quality of life and reducing the dependency on opioid medication.
Pullen et al.	**2014**	**Nigeria**	**Case Study Analysis**	**The key analysis interpreted a complete eradication of the shortness of breath (SOB) upon exertion and relief from pain due to the physiotherapy sessions. In addition, a prominent reduction was also observed in muscle endurance, strength, and resting heart rate. Hence, the physiotherapy interventions comprising of**

				manual therapy and exercise were beneficial as an adjunct therapy.
Pyszora et al.	2017	Poland	Randomised Clinical Trial	Exercising program design led to a prominent decrease in the fatigue scores within the palliative care which positively influenced the day-to-day functioning. These findings led to the belief that physiotherapy is regarded as an effective and safe method in cancer-related fatigue to improve the quality of living.



Discussion

The data analysis has offered a comprehensive evaluation highlighting the contemporary role of the physiotherapist interventions in the treatment and management of palliative care, among key roles frequently identified was promotion of physical activity, exercise intervention, diagnosis and assessing physical condition, walk-retraining, education and advice and developing treatment plans in line with client need as well as involvement. Palliative care is regarded as a holistic practice which involves caring of the people living with life-threatening illnesses or individuals during the end stage of the lives. Though pharmacological interventions are the primary source to manage and treat the palliative care measures, exercise and the physical activity acts as a secondary mechanism to improve the quality of living thereby acting as a cornerstone to the non-pharmacological management [12]. In this context, a physiotherapist led palliative exercise programme (PEP-PD) was designed which was executed for a total of six weeks duration constituting of portable ankle weights. The outcomes of the study clearly signified that a progressive six-week physical therapy improved the muscle strength and intensity of the lower limbs in patients living with Parkinson's disease (PD).

Nonetheless, the improvement in the flexibility and strength did not incur any difference in the severity of the patient condition. Similarly, physiotherapy leads to the maximisation of mobility, independence, and mobility provided adequate treatment and monitoring [13]. In this regard, improving the attitude, knowledge, experience, and beliefs of the physiotherapists to improve the standard and quality of life for the patients in palliative care is important [14]. Hence, physiotherapy-led interventions are integral in promoting individual autonomy, independence, mobility, and body functioning during the end of life care.

Other physiotherapy interventions included the strengthening exercises offered to patients determined that physiotherapy has a positive and direct relationship in improving the patient outcomes and perceived well-being in populations demanding palliative care [15, 21].

Despite the fact that the profession has been under-valued and underestimated across the globe, there is a growing impetus for the improved physiotherapist's interventions and involvements in the in-patient as well as outpatient settings to offer relief from symptom and pain through non-pharmacological interventions. Specific physiotherapy interventions included breathing/aerobic exercises which are beneficial and recommended during the advanced disease progression to offer timely relief to the patients. Physiotherapy leads to a significant reduction in the rate of fatigue in patients receiving palliative care [16, 24].

Physiotherapy interventions are beneficial in the symptom management and alleviation of troublesome pain and discomfort through increased mobility and focusing on physical activity. Additionally, physiotherapy interventions in advanced diseases play a crucial role in improving the overall state of well-being of the patient while subsequently limiting the severity of the comorbid symptoms [17]. Hence, aerobic exercising, awareness, education, and alteration in the breathing mechanisms through physiotherapy interventions could play a positive role in improving the general state of the patients receiving palliative care.

Another physiotherapy intervention is based on generating awareness and improving the educational needs of the patients and the carers. Lim and Ng focused on the effectiveness and importance of the educational needs of the physiotherapists in the domain of palliative care [18, 23]. A lack of confidence and knowledge could lead to a negative influence on the quality of care services thereby affecting the patient well-being receiving palliative care. As opposed, good palliative care is highly dependent on effective communication skills as well as the technical competencies of the physiotherapists. In addition, multivariate role of the physiotherapists is involved in the specialised palliative care through prioritising the patient needs and addressing the emergent issues which directly hamper in the sudden alterations in the health status of the patients [19]. Therefore, educating the patient and creating awareness among the caregivers is also identified as a critical intervention through which the quality of life and well-being of the patients receiving palliative care could be addressed.

Along with educating the patients, education and development of the skillset of the physiotherapists are equally important in developing effective communication and interpersonal therapeutic relationships to provide ease and independence during the last stages of life.

Kumar and Jim (2010) discussed different physical therapy techniques and interventions comprising of therapeutic exercise, electrical modalities, thermal modalities, additional physical agents, and miscellaneous modalities (manual therapies) which offer an inherent role in improving the functional ability and care dimensions during the palliative care. The therapeutic exercises constituted of assisted active movement for offering relaxation, stabilisation, and mobilisation.

Electrical modalities, on the other hand, included the neuromuscular electrical stimulation which has been regarded as useful specifically in pain relief and management. Thermal modalities included the utilisation of heating and cold packs to promote flexibility. Physiotherapists play integral part in the multidisciplinary team involved with patients receiving palliative care [20]. This is done through physical therapy interventions which improve flexibility, muscle strength, durability, and functional mobility, as well as through optimising the respiratory, circulatory, cardiac, and muscular functioning to control pain and improve the functional independence [22]. Thus, physical therapy in palliative care patients is significant in promoting physical strength and independence.

Conclusion

The aim of this research study was to evaluate the role of the physiotherapist intervention in palliative care through critical analysis of the past literature. This systematic review of literature facilitated in analysing different intervention techniques which are globally utilised by physiotherapists for improving the quality of life during the end-stage of the patients. The analysis of the 11 research articles published in a period of ten years (2009 onwards) has identified multivariate intervention techniques which are adopted by the physiotherapists to enhance the general well-being through functional mobility, independence, and educational awareness. The findings also emphasised on the active role of the physiotherapists in pain relief and improvement in the symptoms through non-pharmacological techniques which lead to better outcomes for the patients. Hence, it is subjugated that involvement of the physiotherapists in the multidisciplinary team designed for patients receiving palliative care is essential in improving the physical strength, independence, and autonomy of the patients through optimised control mechanisms.

References

1. Saher, T.; Kalra, S.; Yadav, J.; Thariwal, S.; Yadav, K.; Tanwar, P. Role and importance of Physiotherapy during Palliative Care in India: A Review. World Journal of Research and Review 2018, 7(4), 01-08.
2. Montagnini, M.; Lodhi, M.; Born, W. The Utilization of Physical Therapy in a Palliative Care Unit. Journal of Palliative Medicine 2003, 6 (1), 11–17, doi:10.1089/10966210360510073.
3. What is physical therapy. https://www.wcpt.org/what-is-physical-therapy (accessed Apr 22, 2020).
4. Kumar, S.; Jim, A. Physical Therapy in Palliative Care: From Symptom Control to Quality of Life: A Critical Review. Indian Journal of Palliative Care 2010, 16 (3), 174, doi:10.4103/0973-1075.73670.
5. Guide to Physical Therapist Practice. Physical Therapy 2001, 81 (1), 9.
6. Jette, A. M. Physical Disablement Concepts for Physical Therapy Research and Practice. Physical Therapy 2010, 74 (5), 380–386, doi: 10.1093/ptj/74.5.380.
7. Marcant, D.; Rapin, C.-H. Role of the Physiotherapist in Palliative Care. Journal of Pain and Symptom Management 1993, 8 (2), 68–71, doi:10.1016/0885-3924(93)90102-2.
8. Peter, M.; Ann, C.; Sam, P.; Jacqui, S.; Dai, R.; Andrew, L.; Chris, T.; Ann, C. Complementary Therapists Motivation to Work in Cancer/Supportive and Palliative Care: A Multi-Centre Case Study. Complementary Therapies in Clinical Practice 2009, 15 (3), 161–165, doi:10.1016/j.ctcp.2009.03.004.
9. Jackson, S. L. Research methods and statistics a critical thinking approach; Wadsworth Cengage Learning: Australia, 2016.
10. Salkind, N. J. Encyclopedia of research design; SAGE reference: Los Angeles, 2010.
11. Linsley, P.; Kane, R.; Barker, J.H. Evidence-based practice for nurses and healthcare professionals; Sage Publications: S.l., 2019.
12. Hegarty, D.; Galvin, R.; McGirr, L.; Cahill, F.; McQuillan, R.. Physiotherapy led palliative exercise programme for people with advanced Parkinson's disease (PEP-PD): A feasibility study. Physiotherapy Practice and Research, 2015, 37(1), 31-39, doi:10.3233/ppr-150070.
13. Tomlinson, C. L.; Herd, C.P.; Clarke, C.E.; Meek, C.; Patel, S.; Stowe, R.; Deane, K.H.; Shah, L.; Sackley, C.M.; Wheatley, K.; Ives, N. Physiotherapy for Parkinson's disease: a comparison of techniques. Cochrane Database of Systematic Reviews 2014, (6).
14. Morrow, B. M.; Barnard, C.; Luhlaza, Z.; Naidoo, K.; Pitt, S. Knowledge, Attitudes, Beliefs and Experience of Palliative Care amongst South African Physiotherapists. South African Journal of Physiotherapy 2017, 73 (1), doi:10.4102/sajp.v73i1.384.
15. Jensen, W.; Bialy, L.; Ketels, G.; Baumann, F. T.; Bokemeyer, C.; Oechsle, K. Physical Exercise and Therapy in Terminally Ill Cancer Patients: a Retrospective Feasibility Analysis. Supportive Care in Cancer 2013, 22 (5), 1261–1268, doi:10.1007/s00520-013-2080-4.
16. Przedborska, A.; Misztal, M.; Wroński, M.; Gruziel, D.; Świątczak, M.; Ciałkowska-Rysz, A. Raczkowski, J.W. The effect of physiotherapy on the condition of cancer patients receiving palliative care. Medycyna Paliatywna/Palliative Medicine 2016. 8(2), 68-74.
17. Kaur, D.; Kumar, G.; Billore, N.; Singh, A. Defining the Role of Physiotherapy in Palliative Care in Multiple Sclerosis. Indian Journal of Palliative Care 2016, 22 (2), 176, doi:10.4103/0973-1075.179599.
18. Lim, J.; Ng, K. Educational Needs of Physiotherapists in the Area of Palliative Care: a Multi-Centre Study in Singapore. Physiotherapy 2015, 101, e875–e876, doi:10.1016/j.physio.2015.03.1704.
19. Möller, U. O.; Malmström, M.; Beck, I.; Rasmussen, B. The Variability of Physiotherapeutic Interventions in Specialized Palliative Care. Physiotherapy 2016, 102, e92–e93, doi:10.1016/j.physio.2016.10.094.
20. Laakso, L. The role of physiotherapy in palliative care. Australian family physician, 2006. 35(10), 781.
21. Wilson, C. M.; Briggs, R. Physical Therapys Role in Opioid Use and Management During Palliative and Hospice Care. Physical Therapy 2017, 98 (2), 83–85, doi:10.1093/ptj/pzx108.
22. Pyszora, A.; Budzyński, J.; Wójcik, A.; Prokop, A.; Krajnik, M. Physiotherapy Programme Reduces Fatigue in Patients with Advanced Cancer Receiving Palliative Care: Randomized Controlled Trial. Supportive Care in Cancer 2017, 25 (9), 2899–2908, doi:10.1007/s00520-017-3742-4.
23. Pullen, S.; Chigbo, N.; Chukwudi, N. E.; Chim, A. C.; Chinwe, C.; Chukwunoso, I. S. Physiotherapy Intervention as a Complementary Treatment for People Living with HIV/AIDS. HIV/AIDS - Research and Palliative Care 2014, 99, doi:10.2147/hiv.s62121.
24. Cullum, S. Rehabilitative Palliative Care - a Challenge on the Hospice Inpatient Unit? Physiotherapy 2019, 105, e167–e168, doi:10.1016/j.physio.2018.11.172.

Pentastar

Pentastar Buffalo Resorts
Luxury hotels & Resorts

73 321 144
Plot 423 Mogoditshane
Box 70587 Gaborone Botswana
pentastartlouresorts@gmail.com

Pentastar Kgabo Resorts
Luxury hotels & Resorts

74749090
Mochudi
Box 70587 Gaborone Botswana
pentastartlouresorts@gmail.com

Pentastar Kubu Hotel
Luxury hotels & Resorts

76842929 3710716
Plot 1923 Tlokweng
Box 70587 Gaborone Botswana
pentastartlouresorts@gmail.com

Pentastar Tlou Hotel
Luxury hotels & Resorts

74 749 090 316 6677
Plot 474 Extension 4 Gaborone
Box 70587 Gaborone Botswana
pentastartlouresorts@gmail.com

Pentastar Tlou Resorts
Luxury hotels & Resorts

74749090
Rasesa
Box 70587 Gaborone Botswana
pentastartlouresorts@gmail.com

TOP COLLEGE DOES IT AGAIN.

DDT COLLEGE OF MEDICINE

- PROGRAMS GET RECOGNIZED BY TOP INTERNATIONAL UNIVERSITIES
- MORE THAN 90% OF DDT GRADUATES GET JOB OFFERS (EMPLOYMENT) BY THE LOCAL MARKET
- SOLICITS SPONSORSHIPS FOR ITS GRADUATES ADMITTED IN TOP INTERNATIONAL UNIVERSITIES

(Writes to MOTE/DTEF, SADC, ALL MINES, ALL EMBASSIES, UNITED NATIONS'BODIES)

ONLY THE TOP: EDUCATING FOR GLOBAL SUCCESS

Beauty Mkhutshwa

Doctor Assistant admitted at Eden University in Zambia (Bachelor of Medicine and Surgery - MB ChB)

Mogolodi Kagiso Gaotlale

Doctor Assistant admitted at Eden University in Zambia (Bachelor of Medicine and Surgery - MB ChB)

Shepherd Mothebe

Doctor Assistant admitted at Eden University in Zambia (Bachelor of Medicine and Surgery - MB ChB)

Unopa Thabo Ishmael

Pharmacist admitted at University of Zambia (Master in Clinical Pharmacy)

Tiroyaone Nthusang

Pharmacist admitted at University of Zambia (Master in Clinical Pharmacy)

Katso Orudisa Tlhorungwe

Pharmacist admitted at University of Zambia (Master in Clinical Pharmacy)

Tshegofatso Kebotsamang

Pharmacist admitted at University of Zambia (Master in Clinical Pharmacy)

Amuchilani Waniwa

Pharmacist admitted at University of Zambia (Master in Clinical Pharmacy)

Oagomotsa Brinnah Maweni

Pharmacist admitted at University of Zambia (Master in Clinical Pharmacy)

#ONLY THE TOP

2021 Calendar

DDT COLLEGE OF MEDICINE

January

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

March

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

July

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

November

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

DDT COM ACADEMIC DATES

12th-13th	January	Supplementary Exams
13th-14th	May	Registration
26th-27th	August	Registration
14th-15th	January	Registration
17th	May	Classes begin
30th	August	Classes begin
18th	January	Classes Begin
31st	May-3rd June	QUIZ 1
13th-17th	September	QUIZ 1
1st-4th	february	QUIZ 1
21st-25th	June	Midterm Exam
11th-15th	November	Midterm Exam
1st-4th	March	Mid term Exam
12th-16th	July	QUIZ 2
18th	November	Graduation
22nd -26th	March	Quiz 2
09th-13th	August	Final Exam
1st-5th	November	QUIZ 2
26th-30th	April	Final Exam
16th-20th	August	Orientation
29th	Nov-3rd Dec	Final Exam
20th	Decembe	College closes

BOTSWANA PUBLIC HOLIDAYS

Jan 01st	New Year's Day
Jan 2nd	New year Holiday Day
Feb 14th	Valentine's Day
Apr 10th	Good Friday
Apr 13nd	Easter Monday
May 1st	Labor Day
May 21st	Ascension Day
Jul 1	Sir Seretse Khama Day Holiday
Jul 20th	President Day
Jul 21st	President Day
Sep 30th	Independence Day
Oct 1st	Holiday
Dec 25th	Christmas
Dec 26th	Boxing day

Bachelor of Doctor Assistance (BDA)
Bachelor of Medical Laboratory Science (BMLS)
Bachelor of Pharmacy (BPharm)
Bachelor of Physiotherapy (BPhysio)

3904935
3904924/5
77100000
Plot 13139 - 41 BBS Mall
P.O.Box 70587, Gaborone
www.ddtcollegeofmedicine.com
enquiries@ddtcollegeofmedicine.com

THE LIGHTNING FAST NETWORK

January

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

February

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28						

March

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

April

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	

May

S	M	T	W	T	F	S
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30	31					

June

S	M	T	W	T	F	S
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22	23	24	25	26
27	28	29	30			

July

S	M	T	W	T	F	S
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

August

S	M	T	W	T	F	S
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

September

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

October

S	M	T	W	T	F	S
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24	25	26	27	28	29	30
31						

November

S	M	T	W	T	F	S
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

December

S	M	T	W	T	F	S
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

7682 6969
3166677
www.lightningfastcom.com
P O Box 20217 Bontleng Gaborone

Operating At The Speed Of Light

JOURNAL OF MEDICAL LABORATORY SCIENCE BOTSWANA

DDT COLLEGE OF MEDICINE JOURNALS