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Diseases

Water Borne Disease

Virulent Infections in Children

Highlights

Blood Environmental Pollution

Vivax Malaria in Endemic Region

Discovering Thoughts, Inventing Future

Volume 14

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Survival in Severe Sepsis and Non Fragmented Germ Cells. Virulent Infections in Children and Aborted Blood, Contraceptive Menstrual Blood Environmental Pollution. Proof of Concept Study-Retrospective Analysis

By Elizabeth Jeya Vardhini Samuel, Joseph Vimal, Ramesh, Lalitha KV, Peter Prashanth, Hannah Peter & Bosco Emmanuel

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Abstract- Background: Increased prevalence and mortality of sepsis has been noticed in 20th, 21st centuries after successful implementation of global contraception, abortion in spite of newer antibiotics availability, improved health care provision and advanced technologies, protocols, strategies and policies of management; hence an altruistic retrospective analysis was planned to elucidate association between contraception and prognosis in severe sepsis.

Keywords: *survival in sepsis, fragmented germ cells, reduced endogenous androgen, estrogen surveillance.*

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Survival in Severe Sepsis and Non Fragmented Germ Cells. Virulent Infections in Children and Aborted Blood, Contraceptive Menstrual Blood Environmental Pollution. Proof of Concept Study-Retrospective Analysis

Elizabeth Jeya Vardhini Samuel ^α, Joseph Vimal ^σ, Ramesh ^ρ, Lalitha KV ^ω, Peter Prashanth[¥], Hannah Peter[§] & Bosco Emmanuel^x

Abstract- Background: Increased prevalence and mortality of sepsis has been noticed in 20th, 21st centuries after successful implementation of global contraception, abortion in spite of newer antibiotics availability, improved health care provision and advanced technologies, protocols, strategies and policies of management; hence an altruistic retrospective analysis was planned to elucidate association between contraception and prognosis in severe sepsis.

Methods: Retrospective analysis of data of 40 patients admitted to a tertiary care hospital, with severe sepsis, shock, multiorgan dysfunction, over a span of 60 days, to match against the contraception status was undertaken; they were divided into male, female, belonging to 20-35 years, 36-50 years, 51-70 years and >70years.

Estimation of endogenous androgen for 8 male partners of contraception users, randomly chosen from the community, divided into the three age groups, was also performed.

Retrospective analysis of data of children who presented with dengue fever, H1N1 infection, encephalitis, rheumatic fever with rheumatic heart disease correlating with contraception status of parents, dividing into <5years, 5-12 years and >12-18 years, was undertaken; these children received treatment over the past 4 years of clinical practice of the corresponding author; all the children's parents were contraception users with absolute significance.

Results: Contraception users with severe sepsis, showed 7 fold increase in mortality among 20-35 years [p<0.0005]; 11 fold increased mortality among 36-50years [p<0.0005]and 6 fold increase in mortality among 51-70years; whereas 12 fold survival in severe sepsis was seen in non contraception users among >70years also.[p<0.0005]

Endogenous plasma testosterone levels showed significant decrease in 66.6% of male partners of contraception users aged 20-35 years and 100% among contraception users of >36years to >50years.

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Among children of contraception users, 5 fold increase in encephalitis was seen among <5years [p<0.0005], 7 fold increase in rheumatic fever [p<0.0005] and 11 fold increase in H1N1 [p<0.0005] were seen among 5-12 years; 18 fold increase in dengue [0.0005] was seen among 12-18 years.

Conclusion: Contraception, abortion with its aborted blood, contraceptive menstrual blood pollution favors flourishing growth, emergence, virulence of microbes specially within the house holds, families, towns, countries, globe wherein universal contraception is accepted and practiced; contraception with its smashed fragmentation of germ cells, reduced endogenous estrogen, androgen surveillance, leads to deranged cell metabolism, defaulted genomic repertoire-defaulted embryo like healing capacity of the cells and thereby increases the susceptibility, risk of the host [equal to withered tree] resulting in increased mortality, secondary to severe sepsis, unlike in non contraception users wherein life factors for cell metabolism-germ cells, their hormones are not wantonly, [unaware] destroyed.

Households, families observing small family norms, one child policy have higher aborted blood, menstrual blood pollution favoring microbial flourishing growths, hence the children of contraception users had significantly increased incidence of encephalitis, dengue, H1N1, rheumatic fever. [today Ebola virus]

Keywords: survival in sepsis, fragmented germ cells, reduced endogenous androgen, estrogen surveillance.

I. INTRODUCTION

Increased prevalence of Sepsis and mortality associated with sepsis was obviously increasing since mid 20th, 21st centuries in spite of advancement of research enabling better comprehension of etiopathogenesis, technology, living standards, availability of antimicrobials including inhibitors of extended spectrum of Beta lactamase of the pathogens and promotion of health care services. This reality was felt in all disciplines of medical, surgical practice more in the vulnerable infants, children and elderly also. When the million dollar question `why` was

asked, a faint line of comprehension dawned by a probable association with the stealthily implemented global contraception, abortion at the same time, believed to be without side effects as mentioned in the curriculum but without evidence for the same presumption, since the procedures as such were uneventful e.g. vasectomy, tubectomy. Cost of therapy was escalating though the success was less and failure of therapy was obviously high, unlike the era before contraception wherein simple ampicillin could eliminate Escherichia coli infection from the blood even in patients with liver disease, retrieving the person from hepatic coma.

Hence retrospective analysis of the prognosis in sepsis, correlating with status of contraception was planned.

II. METHODS

The data of 40 patients admitted, to a tertiary care hospital, over a period of 60 days, with severe sepsis, multi organ dysfunction, hypotension, associated co morbidities was analyzed retrospectively for the survival, mortality in sepsis and status of contraception; antibiotics used ranged from Piperacillin Tazobactam, Meropenem, Imipenem, Vancomycin, Polymyxin B, based on culture sensitivity reports.

Estimation of endogenous androgen for 8 male partners of contraception users, randomly chosen from the community, divided into the three age groups, was also performed.

Retrospective analysis of data of children who presented with dengue fever, H1N1 infection, encephalitis, rheumatic fever with rheumatic heart disease correlating with contraception status of parents, dividing into <5years, 5-12 years and >12-18 years, was undertaken; these children were seen over the past 4 years of clinical practice of the corresponding author; all the children`s parents were contraception users with absolute significance.

III. RESULTS

Contraception users with sepsis showed 7 fold increase in mortality among 20-35 years [$p<0.0005$]; 11 fold increased mortality among 36-50years [$p<0.0005$]and 6 fold increase in mortality among 51-70years; *whereas 12 fold survival in severe sepsis was seen in non contraception users among >70years* [$p<0.0005$] *Figure 1*; *all the patients had severe sepsis with multi organ dysfunction, hypotension, renal failure; supportive ventilation was required in most of the patients.*

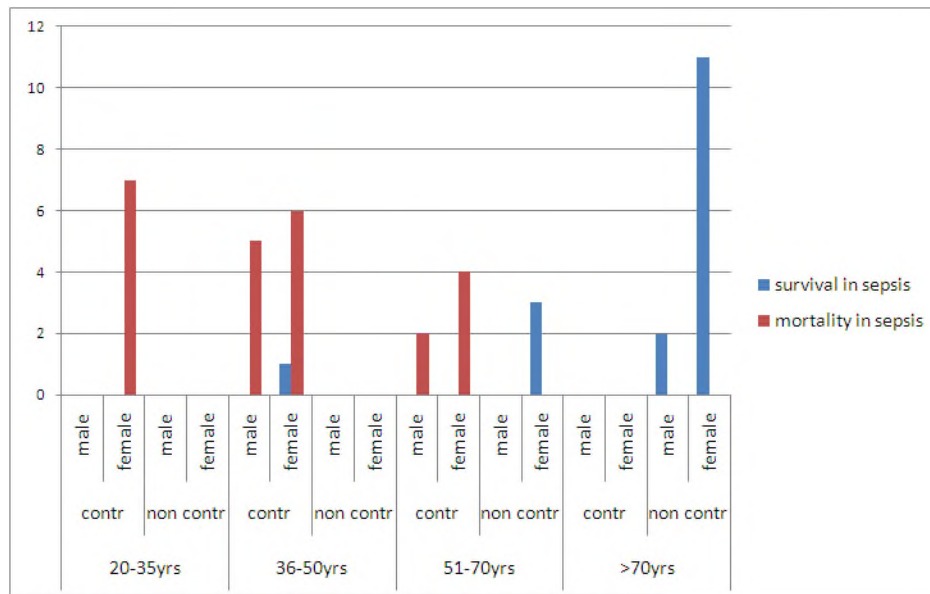


Figure 1 : Survival in sepsis among contraception, non contraception users

There was no difference in male, female of contraception users, non contraception users towards survival or mortality in sepsis; but contraception plays a significant role in increasing mortality [$p<0.0005$]; both partners of contraception are equally affected.

Non contraception users required simpler antibiotics like Ceftriaxone or Cefperazone+ sulbactam as per culture sensitivity, whereas contraception users required, for e.g. Meropenem, Polymyxin, Piperacillin

Tazobactam with increased resistance to many other antibiotics, as per the culture sensitivity; t2 diabetes mellitus, systemic hypertension, coronary artery disease, were present as co morbidities among contraception users, and non contraception users but the contraception users had these co morbidities at much younger age i.e. 20-35 years itself as compared to >50->70years of non contraception users[contraception users had succumbed to sepsis at <1/2 age of non

contraception users-it's a painful truth obviously seen, if only we recognize contraception as a variable].

Endogenous plasma testosterone levels showed significant decrease in 66.6% [p<0.0005] of male partners of contraception users [e.g. wives had

undergone tubectomy, wearing Copper T, had undergone Medical termination of pregnancy..] aged 20-35 years and 100% showed significant decrease among male contraception users aged >36years to >50years [p<0.0005]Figure 2.

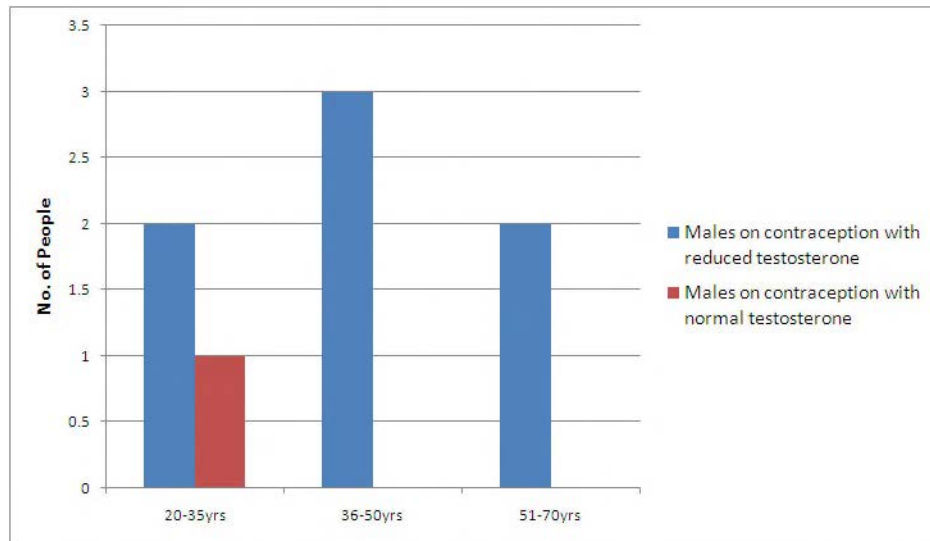


Figure 2 : Prevalence of reduced testosterone in male partners, on contraception

5 fold increase in encephalitis was seen among <5years [p<0.0005], 7 fold increase in rheumatic fever [p<0.0005] and 11 fold increase in H1N1 [p<0.0005] were seen among 5-12 years; 18 fold increase in dengue [0.0005] was seen among 12-18 years children

born to contraception users with few siblings and 200 months more of menstrual blood pollution within the household. All the children's parents were contraception users with absolute significance. Figure 3

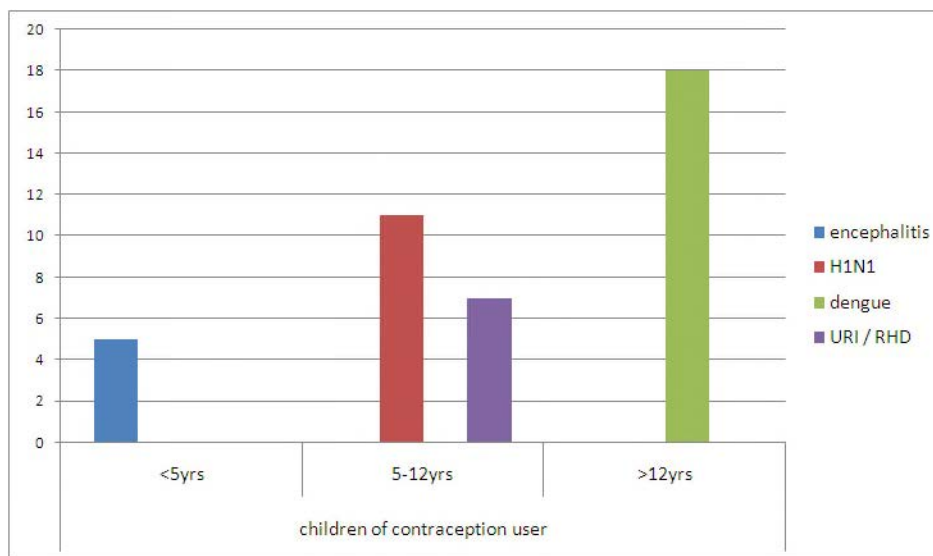


Figure 3 : Increased prevalence of serious infections in children of contraception users

IV. DISCUSSION

Animals mount local and systemic response to microbes that traverse their epithelial barriers and enter underlying tissues. Fever or hypothermia, leukocytosis or leucopenia, tachycardia, tachypnoea are cardinal signs of the systemic responses to microbes i.e.

systemic inflammatory response syndrome. SIRS may have infectious, non infectious etiology; if infection is suspected or proven a patient with SIRS is said to have sepsis; when sepsis is associated with dysfunction of organs distant from the site of infection, the patient has severe sepsis; severe sepsis is accompanied with hypotension and evidence of hypo perfusion; when

hypotension is not corrected by infusing intravenous fluids the diagnosis is `septic shock`; definitions developed by consensus conference committee in 1992 and 2001 have been widely used; there is evidence that different stages form a continuum.

Sepsis can be response to any class of organisms; microbial invasion of the blood stream is not essential; since local inflammation can also elicit distant organ dysfunction and hypotension; blood culture sensitivity yield bacteria or fungi in 20-40% of cases of severe sepsis and 40-70% of septic shock. Individual gram negative or gram positive bacteria account for 70% of the isolates; remainder are a mixture of microorganisms; specific identification of microbial Deoxy ribonucleic Acid or Ribo Nucleic acid in blood or tissue samples is also used; majority of patients with a clinical picture of severe sepsis or septic shock have had negative microbiologic data.

Epidemiological data showed 1 severe sepsis is a contributing factor in > 2 lakh deaths/ year in the United States of America, incidence of sepsis and severe sepsis has increased over the past 30 years and the annual number of cases is now >700,000. Approximately 2/3 of the cases occur in patients with significant underlying illness. Sepsis related mortality rates increase with age and pre existing co morbidity; rising incidence of severe sepsis is presumably attributable to the aging of the population, the increased longevity of patients with chronic diseases and *the relatively high frequency with which sepsis develops in patients with Acquired Immune Deficiency Syndrome*. The widespread use of immune suppressive drugs, indwelling catheters and mechanical devices also play a role.

Invasive bacteriological infections are prominent causes of death around the world, particularly among young children. In sub-Saharan Africa for e.g. careful screening for positive blood cultures found that community acquired bacteremia accounted for at least 25% Of deaths of children > 1 year of age. Non typhoid salmonella species, streptococcus pneumonia, Haemophilus influenza and Escherichia coli are community isolated bacteria. Bacteremic children often had Human immune deficiency viral infection or were severely malnourished.

Patho physiology-Most cases of severe sepsis are triggered by bacteria or fungi that do not ordinarily cause systemic disease in immune competent hosts; to survive within the human body, these microbes often exploit deficiencies in host defenses, indwelling catheters or other foreign matter or obstructed fluid drainage conduits; the concept is *contracepted physique is immune compromised host, high risk host with increased susceptibility due to destruction of germ cells and associated reduced endogenous estrogen, androgen surveillance for cell metabolism, genomic*

repertoire with resultant metabolic syndrome, degenerative changes in cells..

Microbial pathogens in contrast can circumvent innate defenses, because they lack molecules that can be recognized by host receptors or elaborate toxins or other virulence factors; in both cases the body can mount a vigorous inflammatory reaction that results in severe sepsis, yet fails to kill the microbes. The septic response can also be triggered by microbial exotoxins that act as super antigens e.g. toxic shock syndrome.

The concept is *contracepted menstrual blood pollution, aborted blood environmental pollution favored flourishing growth, emergence, virulence of organisms, simultaneously contraception, abortion, impairing the host components-alas the marvellous God ordained physiology being hamperedby artificial wanton contraception- young parents embrace early demise, in spite of advancements in technologies, therapies.*

Hosts have exquisitely sensitive mechanisms for recognizing and responding to certain highly conserved microbial molecules; recognition of the lipid moiety of lipo polysaccharide LPS also called endo toxin is the studied example; a host protein [LPS binding protein] binds lipid A and transfer the LPS to CD4 on the surfaces of monocytes, macrophages and neutrophils. LPS then is passed to MD-2 that is bound to TLRReceptor 4 to form a molecular complex that transduces the LPS recognition signal to the interior of the cell. This signal rapidly triggers the production and release of mediators such as tumor necrosis factor that amplify the LPS signal and transmit to other cells and tissues. Bacterial peptidoglycan and lipopeptides elicit responses in animals that are similar to those induced by LPS; 11 different TLRs have been identified so far in humans; host pattern of recognition proteins that are responsible for sensing microbial invasions include the intracellular NOD1, NOD2 proteins which recognize discrete fragments of bacterial peptidoglycan, flagellin; early complement components [principally in the alternative pathway] and mannose binding lectin and c reactive protein which activate the classic complement pathway.

A host's ability to recognize certain microbial molecules may influence both the potency of its own defenses and the pathogenesis of severe sepsis; recognition of microbial molecules by tissue phagocytes triggers the production of numerous host molecules that increase blood flow to the infected tissue, increases the permeability of blood vessels, recruit neutrophils to the site of infection and elicit pain; these reactions are familiar elements of local inflammation, the body's frontline innate immune mechanisms for eliminating microbial invaders; systemic responses are activated by neural and or humoral communication with the hypothalamus and brain stem; these responses enhance local defenses by increasing blood flow to the infected area, increasing the number of circulating

neutrophils and increasing blood levels of numerous molecules that have anti infective functions. In septic shock there is decrease in peripheral vascular resistance in spite of vasopressin catecholamine; oxygen delivery to the tissues is compromised by myocardial depression, hypovolemia; blood lactate levels are elevated, central venous oxygen saturation is low.

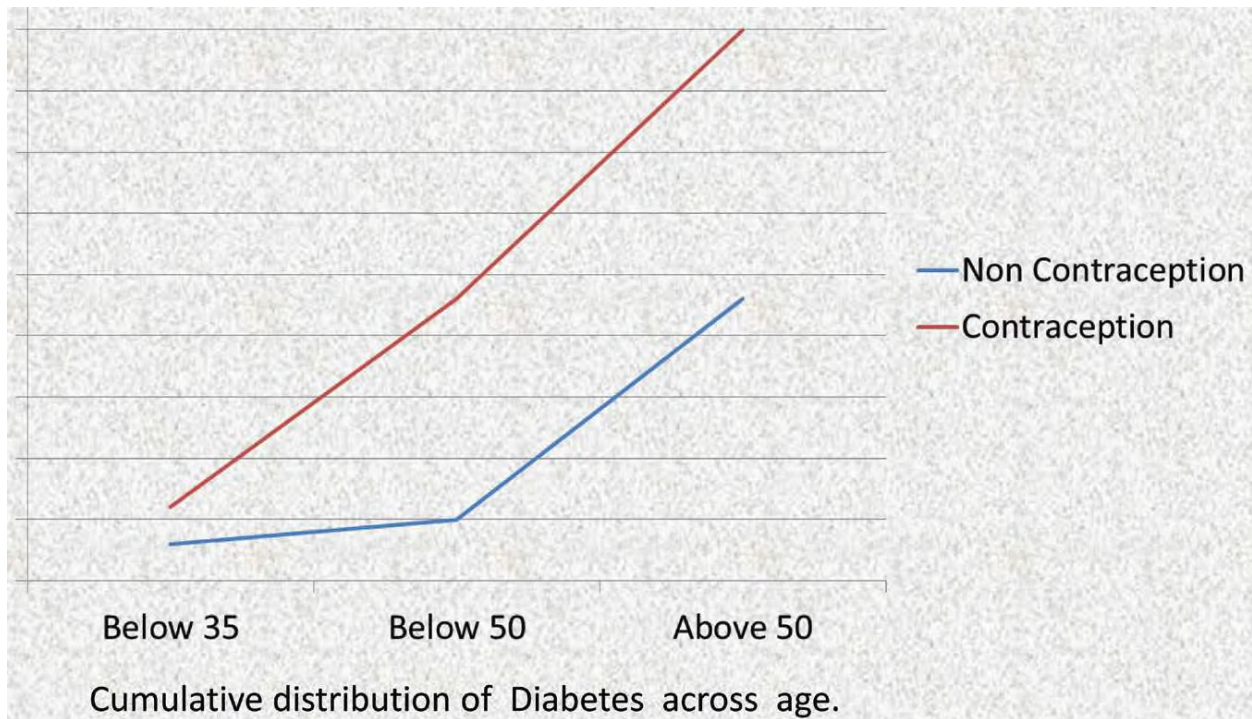
20-35% of patients with severe sepsis and 40-60% of patients with septic shock die within 30 days; others die within the ensuing 6 months; case fatality are similar to culture negative and culture positive severe sepsis; age and prior health status are important risk factors; *case fatality rate is < 10% until 4th decade after which it increases to 35% in the very elderly.*

The concept is, contraception smashes the germ cells to fragments i.e. acentric fragments, ² chromatid breaks, ring chromosomes, consequently there is decrease in endogenous estrogen, androgen; decrease in endogenous estrogen is³ seen in 61%

[$p < 0.0005$] of contraception users; in our study the endogenous testosterone levels are reduced less than 50% of low normal in 66.6% among 20-35 years, and grossly reduced in 100% among 36->50 years [$p < 0.0005$].

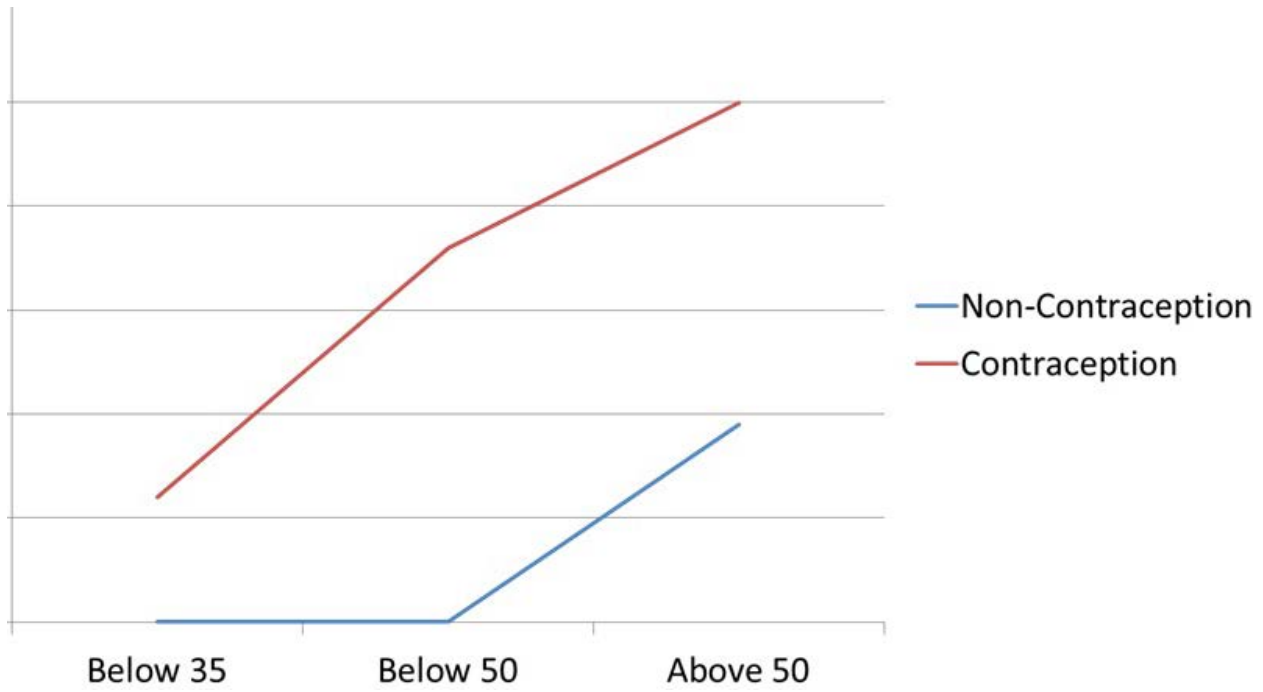
Decreased endogenous estrogen, androgen surveillance results in deranged⁴ cell metabolism, defaulted genomic repertoire i.e. embryo like healing in the cells, high risk host with impaired immune response, leading to increased mortality in sepsis uniformly among contraception users aged 20->70 years [$p < 0.0005$]; whereas the non contraception users though they were among >50 - >70 years with co morbidities, receiving similar treatment with antibiotics, supportive therapy with fluids, oxygen, they showed gratifying survival.

Its been documented earlier that contraception users had high incidence of T2 diabetes mellitus, systemic hypertension at young age as follows; contraception, abortion was associated with 10 - 45 fold⁵ increase in Type 2 diabetes mellitus; figure 4;

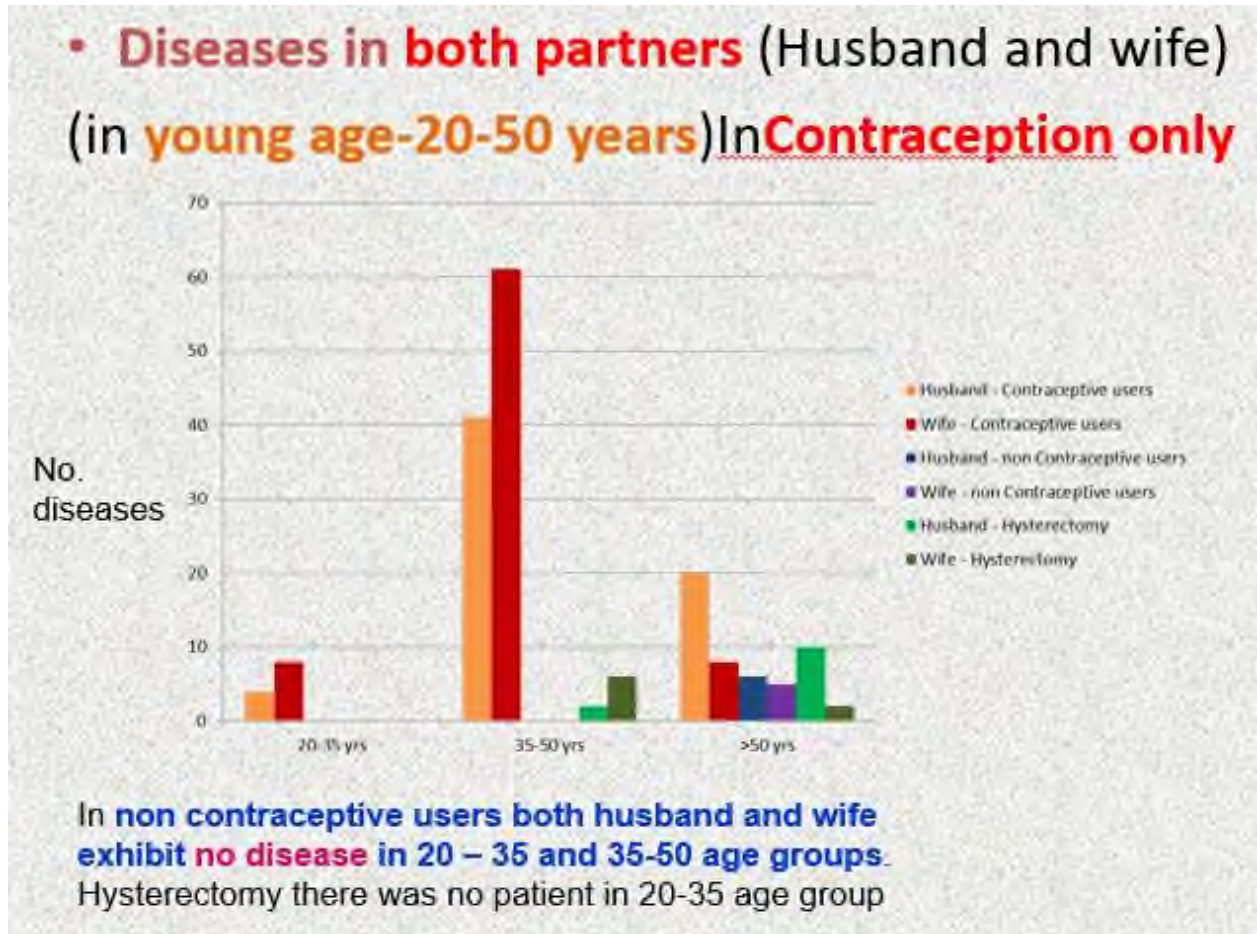


evallence of Diabetes Mellitus and contraception [reference5]15 -50 fold increase in systemic hypertension, among >20 years to >50 years of age; figure 5 there was absolute correlation i.e. the people who did not use contraception did not develop diabetes mellitus or systemic hypertension in young age of 20 - 50 years; both partners who were using contraception had diseases including diabetes mellitus, hypertension-color figures-supplementary files.



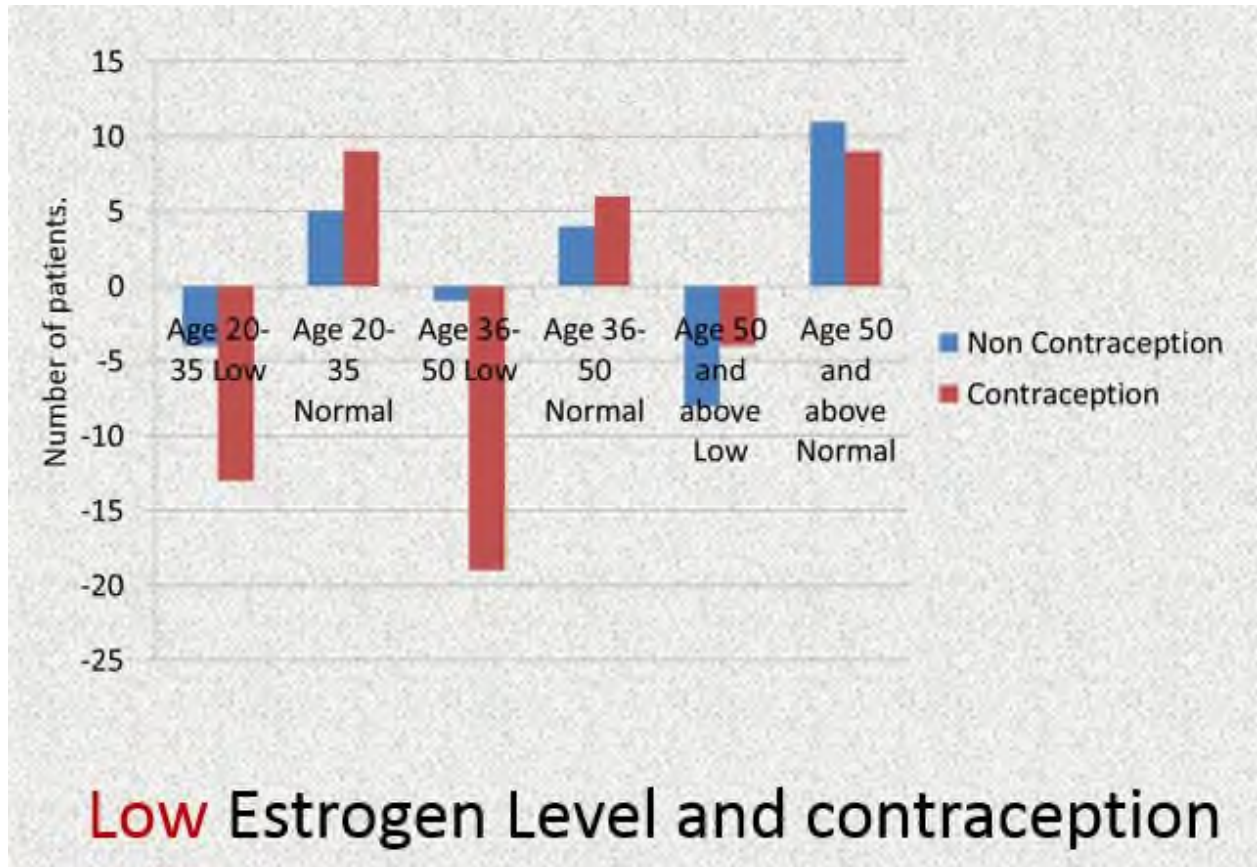


Prevalence of Hypertension and contraception [reference 5]



Reference-5

Endogenous estrogen was grossly reduced to ~5 - 8 pg in 75% of people using contraception: in 20 to <50 years age group; after hysterectomy estrogen had redced to as low as 0.4 pg, suggesting endogenousu Estrogen, androgen surveillance dependent cell-genomic repertoire, differentiation followed by controlled Multiplication of cell cycle, cell metabolism defaults, leading to increased incidence of degenerative diseases including diabetes mellitus, systemic hypertension; any form of contraception results in smashed fragmentation of germ cells leading to this decrease in endogenous hormones.



Reference: 3

The contraception users of this study also had co morbidities at younger age itself enabling easy susceptibility to sepsis at young age itself, with added impaired genomic repertoire-embryo like healing capacity in the cells secondary to contraception fragmenting germ cells, with associated reduction in endogenous estrogen, androgen.

In 1994 Dr. Susan Jobling of ⁶ Brunel University of United Kingdom, observed that estrogenic compounds are the pollutant in river waters, when they attempted to find the pollutant responsible for the disappearance of fish. In 1998 Professor Paul Devroey ⁷ identified `estrogen like particles are in the rise in the air` as pollutant, when they attempted to analyze the cause for increase in infertility. Global abortion summary mentioned 863,000,000 reported ⁸ surgical abortions till 2010; 498 abortions per minute in the globe; United Nations mentioned 3,750,000 reported surgical abortions /year.

Estrogen is a steroid hormone derived from cholesterol[hence it gets the name-cholesterol-steroid],

secreted directly into the blood, circulates in the blood, bathes, nurtures each cell; its surveillance is essential for cell differentiation, controlled multiplication, cell metabolism, cell cycle, essential for genomic repertoire; Unless blood is shed estrogen cannot reach the environment; during teen age estrogen levels will be 100pg-300pg [trillionth-a very small amount]; >37 years-the estrogen levels decrease to 15 pg; ~80 years, estrogen levels will be 5pg; during pregnancy placenta has to secrete 4200pg of estrogen, otherwise the fetus will be spontaneously aborted around 3_{rd} month, called as placental switch over insufficiency.

If a person >50years` blood is spilt by murder, 150 ml of blood loss × 15pg = 2250pg estrogen

contaminant to the environment; if a teenager's blood is spilt by accident then 150 ml of blood loss $\times 300\text{pg} = 45000\text{pg}$ estrogen contaminant to the environment; when a pregnancy is aborted eg. 498 abortions /minute $\times 60$ minutes $\times 24$ hours $\times 365$ days $\times 60$ -80 years $\times 4200\text{pg}$ of estrogen $\times 350\text{ml}$. blood loss = estrogen pollutant of the air, water; if a mother is blessed with 10 children she will not menstruate for minimum 200 months or 20 years, of the ~25 years menstrual span; whereas with contraception, small family norms, a lady menstruates 200 months more; so 1989, 375,754 women of reproductive age group [15-45 years] $\times 350\text{ml}$ blood loss/menstruation $\times 300\text{pgm}$ estrogen $\times 200$ months/woman = environmental estrogen pollutant; Global innocent aborted blood, contraceptive menstrual blood polluted air, water inhalation, ingestion respectively;

Rising environmental estrogen, equates with innocent aborted blood, contraceptive menstrual blood pollution of air, water. Detected alpha feto protein, β human chorionic gonadotropins in river, sea water further confirm aborted blood environmental pollution.

Innocent aborted blood, contraceptive menstrual blood, being a good media for emergence

growth, virulence of microbes, new viruses¹⁰ had emerged since 1980s namely Hepatitis A, B, C, D, E, Human immunodeficiency virus, SARS virus, H1N1 virus, encephalitis viruses; Chikungunya virus, dengue viral illnesses though were existing already, it was known by curriculum, but in the past decade we have treated thousands of people with chikungunya, dengue fever-strains¹¹ isolated were that from our neighbor country, wherein compulsory abortions up to 25 times per lady, is practiced to implement one child policy, with their high innocent aborted blood pollution, promoting the virus transit from its native soil to our country where permanent sterilization is implemented..

~2003, Escherichia coli bacteremia resisted meropenem, requiring Tazobactam combination, whereas in 1980s ampicillin was sufficient to curtail Escherichia coli bacteremia to bring alive patients from coma, with liver disease; less virulent fungal infections are isolated more frequently in blood cultures, e.g. Candida, secondary to environmental aborted blood, contraceptive menstrual blood pollution.

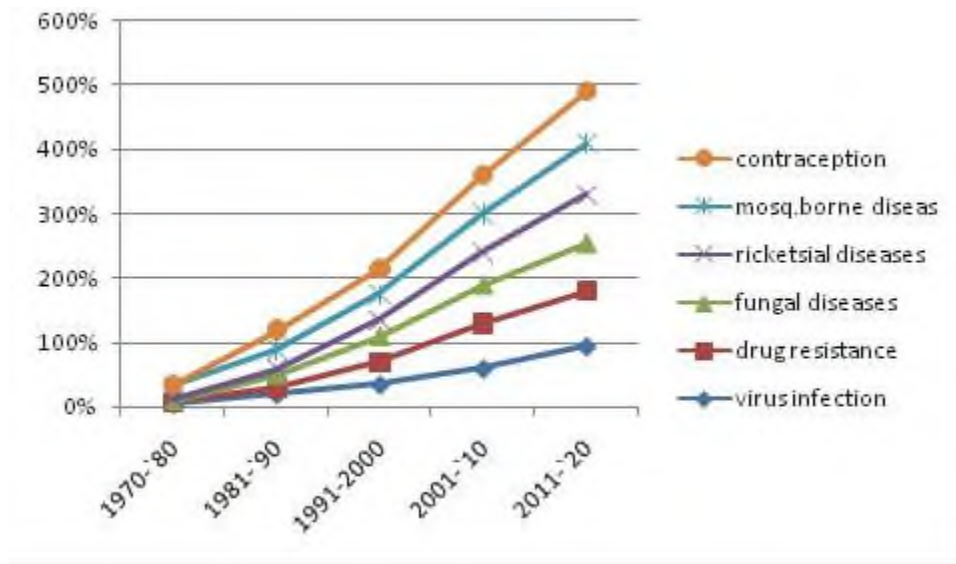


Figure- Increased prevalence of infectious diseases and contraception, abortion. Reference 9

From 1976 Ebola virus has emerged and epidemics are increasing secondary to the increasing global aborted blood pollution, increasing global contraceptive menstrual blood pollution.

This study also corroborates 4-18 fold increased prevalence, of serious infections among children born to contraception users, namely encephalitis, dengue, H1N1, rheumatic fever; the families, households, places with decreased number of children, increased contraceptive menstrual blood, aborted blood pollution are susceptible to increased incidence of serious infections, including invitation to Ebola virus disease.

V. CONCLUSION

The concept is contraception smashes the germ cells to fragments; consequent reduction in endogenous estrogen, androgen results in deranged cell metabolism, defaulted genomic repertoire; thereby increasing the susceptibility of host, increases the risk of the host [akin to withered tree without life factors] by 4-7 fold increased prevalence of sepsis and increases

mortality with severe sepsis in contraception users, involving both partners.

66% of male partners among 20-35years, whose wives had undergone sterilization showed reduced testosterone levels [$p < 0.0005$] and 100% of the male partners showed significant decrease in testosterone levels among >35 years to >50 years of contraception users.

Contraception users with sepsis showed 7 fold increase in mortality among 20-35 years [$p < 0.0005$]; 11 fold increased mortality among 36-50years [$p < 0.0005$] and 6 fold increase in mortality among 51-70years; *whereas 12 fold survival in severe sepsis was seen in non contraception users among >70years [$p < 0.0005$].*

Contraception users had co morbidities and had succumbed to sepsis in a younger age i.e. <1/2 [~35years] as compared to that of non contraception users [70 years] who survived the severe sepsis by their intact God ordained physiology of cell metabolism, genomic repertoire, robust host defense mechanisms unaltered by contraception in old age also.

The house holds, families with contraceptive blood, aborted blood pollution, secondary to practice of small family norms, one child policy, have absolutely increased incidence 5-18 fold increase of rheumatic fever, dengue, encephalitis, H1N1 infections [$p < 0.0005$] among the children born to parents practicing contraception, abortion; today Ebola virus disease is emerging to produce epidemics, promoted by global contraceptive menstrual blood pollution, global aborted blood pollution.

Key points:

- 12 fold survival in severe sepsis was seen in non contraception users, even among >70years [$p < 0.0005$]
- Contraception users with severe sepsis showed 7 fold increase in mortality among 20-35 years [$p < 0.0005$]; 11 fold increased mortality among 36-50years [$p < 0.0005$] and 6 fold increased mortality among 51-70years.
- Contraception, abortion with smashed fragmentation of germ cells, con repertoire, increases the host susceptibility to sepsis, impairs host defense mechanisms and results in high risk host [withered host].
- 66% of male partners using contraception showed grossly reduced testosterone levels among >20years to >50 years.
- sequent reduced endogenous estrogen, androgen, with resultant deranged cell metabolism, genomic
- Children born to parents using contraception showed absolute increase of 5-18 fold in prevalence of H1N1, encephalitis, rheumatic fever, Dengue fever, secondary to contraceptive menstrual blood

pollution, aborted blood environmental pollution of the habitat.

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Determinant Factors of Treatment Failure among Tuberculosis Patients under Directly Observed Therapy in Tigray Regional State Public Hospitals, North Ethiopia: A Case-Control Study

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Abstract- Introduction: Tuberculosis continues to be one of the major public health problems in Ethiopia. In 2009 the country ranked 7th from the 22 TB high burden countries by estimated number of case. It is also showed that the country has lower treatment success rate sated by World Health Organization. Therefore, the aim of this study is to assess determinant factors of tuberculosis treatment failure among patients directly Observed therapy in Northern Ethiopia.

Methods: Unmatched case-control study was conducted among randomly selected health facilities found in northern Ethiopia from February to October 2013. Samples were 77 cases and 153 controls recruited during the course of TB treatment. Cases were TB patients those declared as treatment failure and control were as cured after completion of the treatment (after 5 months of treatments). Both cases and controls were selected from TB clinics. Data were analyzed by SPSS version 16.0. Bivariate and multivariate logistic regression (Odds Ratio) with 95% CI was used to see the associations.

Keywords: tuberculosis, treatment failure, determinant factors, northern Ethiopia.

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Abstract- Introduction: Tuberculosis continues to be one of the major public health problems in Ethiopia. In 2009 the country ranked 7th from the 22 TB high burden countries by estimated number of case. It is also showed that the country has lower treatment success rate sated by World Health Organization. Therefore, the aim of this study is to assess determinant factors of tuberculosis treatment failure among patients directly Observed therapy in Northern Ethiopia.

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Result: After Adjusted for confounders, having cough for more than 9 weeks before TB diagnosis, experience of side effect such as vomiting, headache and numbness of the hand and leg were positively associated with TB treatment failure. Where as being in age between 30-39 years compared to 40 years and above and being farmers were a negatively risk factors. Living in the same house with 5 or more family members, HIV positive, having history of previous self & family member TB infection and missing TB drug were also the risk factors for TB treatment failure.

Conclusion: side effect and late coming for TB diagnosis related failure were important factors. Therefore; early treatment for side effect and effective counseling and health education to community and TB patient would have paramount importance in prevention of TB treatment failure and MDR-TB.

Keywords: tuberculosis, treatment failure, determinant factors, northern Ethiopia.

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I. INTRODUCTION

Tuberculosis (TB) is one of a contagious disease which spreads through the air. When infectious persons cough, sneeze, talk or spit, they transmit the disease causing germs into the air which is inhaled with air and transmitted to another person [1]. After the disease introduced in to the person it is broadly classified in to pulmonary TB (smear positive and smear negative) and extra pulmonary TB and the disease is commonly diagnosed by sputum smear microscope [2].

The treatment progress of the patient with the disease is assessed by sputum examination for pulmonary TB patient. The new pulmonary TB patients with smear positive at the start of treatment should be monitored by sputum smear microscopy at the end of the fifth and seventh months. If results at the fifth or seventh month are positive, treatment has failed, and outcome is labeled as treatment failure and patient is treated as treatment failure type [3].

Tuberculosis is a global health concern. It is a major cause of illness and death worldwide second to HIV/AIDS, especially in low and middle income countries where it is fuelled by the presence of HIV/AIDS [4]. The World Health Organization (WHO) report on tuberculosis indicated that, in 2010, there were 8.8 million incident cases of tuberculosis, and 1.1 million deaths from TB among HIV-negative people and an additional 0.35 million deaths from HIV-associated TB. Majority of cases were (40%) occurred in India and China and 82% of TB cases were from the 22 high-TB burden countries which includes Ethiopia. From the global cases Africa also accounts for 24% notified cases [5]. In addition, the incidence in Sub-Saharan Africa is twice that of South Asia which has highest prevalence from the world [6].

After the introduction of directly observed therapy (DOT), the number of people being cured from TB are increasing, but millions will remain ill because they lack access to high-quality care [7]. And the treatment success rate among smear positive pulmonary TB reached 87% globally in 2009, but in the

Africa region it is 80% which is lower than WHO target. Among the 22 high burden countries 15 of the reached the target and Ethiopia is one of the 7 countries from which treatment success rate lower than the target [6].

Even though, Ethiopia adopted and fully implemented the DOT, TB continues to be a major public health problem which puts the countries at 7th rank from the 22 TB high burden countries by estimated number of case [8]. In 2009 TB is the 5th cause of admission, the 3rd leading cause of death with 67% cure rate for registered patient in the same year in Ethiopia [9]. In addition to these, for all new TB cases, 20% of them have a chance to be multidrug-resistant (MDR) TB [10].

Since, there is limited study about determinants treatment failure among TB patient in the country and study area, thus, this study is aimed to identify the determinants factors of treatment failure among tuberculosis treated patients in health settings found in Northern Ethiopia using case control study.

II. METHODS

Study setting: The study was conducted in health centers and hospitals found in north Ethiopia from February to October 2013. In the region there are 16 governmental, 2 private hospitals and 211 health centers [11].

Sample size and study design: Unmatched case-control study was conducted by taking patient who completed tuberculosis treatment course. New smear positive TB cases who registered at TB clinic was included in the study. Patients declared as treatment failure were taken as case and cured were as controls. All adult patients (age 15 years and above) who were smear positive at the beginning of the treatment and declared as cured (smear negative) at the end of DOTS course was included as control. All adult Patients who were smear positive at the beginning of the treatment and declared as treatment failure (smear positive) was included as a case.

Sample was taken by two population proportion formulas by considering proportion of exposure among the patients with treatment failure place of residence was taken to calculate the sample size by considering 20% exposure among poor treatment outcome from south region of Ethiopia study and odd ratio 2.5 [12] and is calculated using Epi- info version 3.5.1. We use 95% CI and 80% power of test with 1:2 ratio of case to control. Accordingly, a total sample size of 230 (77 cases and 153 controls) were included from the selected hospitals and health centers. After considering 10% of non response a total sample size 253 will be required.

Sampling procedures: Cases and controls were selected from randomly selected health facilities (4 hospitals and 6 health centers) providing TB treatment based on proportional to population size ratio allocation methods. Cases was selected if the patient declared to

be treatment failed, i.e. if the patient had smear positive result at fifth month and later. Controls were selected randomly from patient who declared cured from the disease. Systematic simple random sampling was used in selection of control, but the cases were enrolled to the study until the required sample size was filled.

Data collection: We considered as "cured":- if patient whose sputum smear or culture was positive at the beginning of the treatment but who was sputum smear- or culture-negative in the last month of treatment; and "Treatment Failure":- if patient who was initially smear-positive and who remained smear-positive at month 5 or later during treatment or a patient on re-treatment.

The instrument was prepared by reviewing similar literatures [12-14, 22]. The questionnaire was prepared in English and translated to Tigrigna and it was checked for its consistency by back translation to English by two different individual. The data was collected using pre-tested interviewer guided semi-structured questionnaire. Data was collected through interviewer guided face to face interview and medical record reviews of patients. Information on socio-demographic characteristics, patient's disease status, treatment regimen, disease co-morbidity, knowledge to ward TB treatment, treatment adverse effect, personal habits, nutritional related factors and health service related factors was collected directly from the respondents. Information on treatment regimen, sputum re-examination and treatment outcome was taken from TB clinic patient registration. Data was collected by a 10 nurses who has experience in TB treatment and care. Data collection process was strictly supervised by supervisors and the data were checked for consistency and completeness. Incomplete and unclearly filled questionnaires were given back to the interviewer to be completed.

Data processing and analysis: Data entry and cleaning was done using EPI Info version 3.5.1 and was analyzed by SPSS version 16. The data was summarized and descriptive statistics was computed for all variables according to type. Frequency, mean and standard deviation were obtained for continuous variables while the categorical variables were assessed by computing frequencies.

A bivariate analysis was used to describe the association between independent and dependent variables and a multivariate analysis also was used to show the factors determining outcome variables. To determine the factors most strongly associated treatment failure, odds ratio at 95% CI was determined by using logistic regressions analysis and $P \leq 0.05$ will be considered significant for all the independent variables in the model. The final model was fitted using the Hozmer and Lem show Goodness of test. Confounders, interaction and Multi-collinarity were checked to minimize bias.

Ethical clearance: The study protocol was reviewed and approved by health research ethics review committee of the College of Health Sciences at Mekelle University. Permission to undertake the study was obtained from every relevant authority in Tigray regional health bureau, hospitals and health centers. Written informed consent was obtained from the participants prior to participation in the study, and data collection was conducted confidentially.

III. RESULT

Scio-demographic characteristics of respondents: Of the total study population who visited the TB clinic in northern Ethiopia during study period; 230 study participants completed the interview in all study sites, a response rate of 91%. Among these 64(27.8%) were cases (failure) and 166(72.2%) were controls (cured from TB). Male participants were 139(60.4%) and the

rest were females. Majority of the failure as well as cured patient after TB treatment were between 40 and above years of age. The median age of patients among failure was 40 years and 29 years among cured. Majority of the study subjects were married; (35.9% of failures and 47.6% of cured TB patients). About 21.9% of failure and 10.8% of cured patients were not employed. Major proportion of failure and cured patients after TB treatment were Orthodox Christian follower (98.4% vs. 97.6% respectively). About 26.6% of failure and 17.5% of cured patients' complete 1-6 grade and most of the failure (71.9%) and cured patients (57.8%) live in urban area. The mean \pm SD family size of study subjects was 3.7 ± 2.1 (SD). About 48.4% failure and 11.4% cured patients were infected with HIV among those HIV positive participant; 27.2% of failure and 89.5% of cured parents' were started ART (Table 1).

Table 1 : Socio-demographic characteristics of TB patients, Northern Ethiopia, 2013

Variables	Cases N=	Control	Total
	64	N=166	
	No(%)	No(%)	No(%)
Age (years)			
<=19	6(9.4)	30(18.1)	36(15.7)
20-29	11(17.2)	55(33.1)	66(28.7)
30-39	13(20.3)	36(21.7)	49(21.3)
40+	34(53.1)	45(27.1)	79(34.3)
Sex			
Male	41(64.1%)	98(59%)	139(60.4%)
Female	23(35.9%)	68(41%)	91(39.6%)
Religion			
Orthodox	63(98.4)	162(97.6)	225(97.8)
Muslim	1(1.6)	4(2.4)	5(2.2)
Educational status			
Illiterate	7(01.9)	24(14.5)	31(13.5)
Read and write	5(7.8)	25(15.1)	30(13)
1-6 grade	17(26.6)	29(17.5)	46(20)
7-8 grade	8(12.5)	21(12.7)	29(12.6)
9-12 grade	13(20.3)	32(19.3)	45(19.6)
Above 12 grade	14(21.9)	35(21.1)	49(21.3)
Marital status			
Single	20(31.2)	65(39.2)	85(37)
Married	23(35.9)	79(47.6)	102(44.3)
Divorced	17(26.6)	17(10.2)	34(14.8)
Widowed	2(3.1)	3(1.8)	5(2.2)
Separated	2(3.1)	2(1.2)	4(1.7)
Owen income			
Yes	37(57.8)	94(56.6)	131(57)
No	27(42.2)	72(43.4)	99(43)
Residence			
Urban	46(71.9)	96(57.8)	142(61.7)
Rural	18(28.1)	70(42.2)	88(38.3)
HIV status			

Positive	31(48.4)	19(11.4)	50(21.7)
Negative	33(51.6)	147(88.6)	180(78.3)
ART started			
Yes	23(74.2)	17(89.5)	40(80)
No	8(25.8)	2(10.5)	10(20)
Live with			
Alone	21(32.8)	42(25.3)	63(27.4)
Family	29(45.3)	87(52.4)	116(50.4)
Relative	12(18.8)	32(19.3)	44(19.1)
Other*(friend, group)	2(3.1)	5(3)	7(3)

Household characteristics and variables from measurements: About 31.2% of failure and 36.7% of cured patients has family size 5 and above. Most of participant 60.9% of failure and 59.6% of cured patient live in the same house with 3 and more family members.

Most of the of the houses of study participant has windows 84.4% among failure and 75.9% among cured patients but in 11.1% failure and 10.3% cured patients the window cannot be opened (Table 2).

Table 2 : Household characteristics TB patients, Northern Ethiopia, 2013

Variables	Cases	Control	Total
	N= 64	N=166	
	No(%)	No(%)	No(%)
Family size			
<=2	19(29.7)	59(35.5)	78(33.9)
3-4	25(39.1)	46(27.7)	71(30.9)
>=5	20(31.2)	61(36.7)	81(35.2)
No of people live in the same house			
<=2	25(39.1)	67(40.4)	92(40)
3-4	31(48.4)	59(35.5)	90(39.1)
>=5	8(12.5)	40(24.1)	48(20.9)
Home has window			
Yes	54(84.4)	126(75.9)	180(78.3)
No	10(15.6)	40(24.1)	50(21.7)
Window open			
Yes	48(88.9)	113(89.7)	161(89.4)
No	6(11.1)	13(10.3)	19(11.6)
Frequency of window open			
Always	18(37.5)	29(25.7)	47(29.2)
Once	30(62.5)	84(74.3)	114(60.8)

Nutritional status of study participants: Most of the study participant were under weight with BMI <=19 which 68.8% of failure and 51.2% of cured patients were malnourished. During the treatment of TB; most of the patients, 79.6% failure 69.9% cured had developed loss

of appetite which was occurred usually among 53.1% failure and 48.3% cured patients. Most of the TB patients had food problems after acquiring the infection 73.4% failure and 50.6% cured patients (Table 3).

Table 3 : Nutritional status and nutrition problems of TB patients, Northern Ethiopia, 2013

Nutritional related variables	Cases	Control	Total
	N= 64	N=166	
	n(%)	n(%)	n(%)
BMI current			
<=19 under weight	44(68.8)	85(51.2)	129(56.1)
20-24(normal)	19(29.7)	78(47)	97(42.2)
>=25 over weight	1(1.5)	3(1.8)	4(1.7)
Food type frequently eaten			
"Shiro" (made of bean)	52(81.2)	155(93.4)	207(90)
Meat	3(4.7)	2(1.2)	5(2.2)

Egg	3(4.7)	3(1.8)	6(2.6)
Milk	2(3.1)	4(2.4)	6(2.6)
Vegetable	2(3.1)	1(0.6)	3(1.3)
Other	2(3.1)	1(0.6)	3(1.3)
Lost appetite during TB treatment			
yes	49(79.6)	116(69.9)	165(71.7)
No	15(23.4)	50(30.1)	65(28.3)
Frequency of lost appetite			
Always (more than 5/week)	12(24.5)	30(25.9)	42(25.5)
Usually (2-4 per week)	26(53.1)	56(48.3)	82(49.7)
Rarely (less than 2 time/wk)	11(22.4)	30(25.9)	41(24.8)
Food problem after infection			
Yes	47(73.4)	84(50.6)	131(57)
No	17(26.6)	82(49.4)	99(43)
Frequency of Food problem			
Always	6(12.8)	7(8.3)	13(9.9)
Usually	9(19.1)	14(16.7)	23(17.5)
Occasionally	9(19.1)	6(7.1)	15(11.5)
Rarely	23(49)	57(67.9)	80(61.1)

Health care system related factors: According to the study participants most of the time the opening time of TB clinic was convenient for 93.8% failure and 91.6% cured patients. For majority of study participants, 89.1% failure and 88% cured patients the waiting time at TB clinic were less than 30 minutes. View of study participants towards interaction of health provider at TB clinic with them considered by most patients as having very good interaction by 46.9% of failure and 51.2%

cured patients. Most of the study participants 87.5% failure and 97% cured patient's travel to the TB clinic on foot in which it takes less than or equal to 30 minutes to reach to TB clinics. During their treatment time most of study participants 71.9% failure and 36.9% cured patients were helped by their families and took care and drug 46.9% failure vs 37.3% cured patients from health center (Table 4).

Table 4 : Health care system related factors during TB treatment among TB patients, Northern Ethiopia, 2013

Health care system related factors	Cases N= 64	Control N=166	Total
	No(%)	No(%)	No(%)
TB clinic opening time convenient for Pt			
Yes	60(93.8)	152(91.6)	212(92.2)
No	4(6.2)	14(8.4)	18(7.8)
Waiting time at TB clinic in minute			
<=30 minutes	57(89.1)	146(88)	203(88.3)
31-60 minutes	4(6.2)	10(6)	14(6.1)
>=61 minutes	3(4.7)	10(6)	13(5.7)
Care giver during intensive phase			
Health extension worker	4(6.2)	4(2.4)	8(3.5)
Nurse at TB clinic	59(92.2)	161(97)	202(95.7)
Others	1(1.6)	1(0.6)	2(0.9)
View of patient toward attitude of health professional at TB clinic			
Very good	30(46.9)	85(51.2)	115(50)
Good	24(37.5)	47(28.3)	71(30.9)

Medium	10(15.6)	34(20.5)	44(19.1)
Type of transportation used by patient to TB clinic			
Foot	56(87.5)	161(97)	217(94.3)
Taxi	8(12.5)	5(3)	13(5.7)
Time taken to reach to TB clinic			
<=30 minute	50(78.1)	121(72.9)	171(74.3)
30-60 minute	11(17.2)	30(18.1)	41(17.8)
>=30 minutes	3(4.7)	15(9)	18(7.8)
Who help you during TB treatment at home			
No one (myself)	4(6.2)	30(18.1)	34(14.8)
Family	46(71.9)	106(36.9)	152(66.1)
Volunteer	7(10.9)	18(10.8)	25(10.9)
Others (friends, housewife)	7(10.9)	12(7.2)	19(8.3)
Institution where provide care & drug during intensive phase			
Health post	9(14.1)	45(27.1)	54(23.5)
Health center	30(46.9)	62(37.3)	92(40)
Hospital	24(37.5)	54(32.5)	78(33.9)
Other (private clinic, Hospital)	1(1.6)	5(3)	6(2.6)

Predictors of Tuberculosis treatment failure after taking DOT: Adjusting for other variables; study participants whose age between 30-39 years had reduced the odd likely hood of risk of TB treatment failure compared to those 40 years old and above (AOR= 0.56, 95% CI=0.028, 0.56). Similarly being farmers by occupation is a reduced likelihood of risk compared with a person with no job (AOR= 0.248, 95% CI=0.077, 0.8). patients those who had more than 9 weeks cough before TB diagnosis were higher risk of treatment failure to occur (AOR=86.3, 95% CI=3.82, 1.95) compared with those who had less than 4 week cough.

The study participants were also compared with respect to the experience of side effect of TB treatments, subject who experience vomiting as side effect of TB treatment had higher risk TB treatment failure (AOR=32.9, 95% CI=3.27, 330.2); patient with headache also higher risk (AOR=7.87, 95% CI= 1.3, 47.38), and patient with numbness of the hand and leg were also higher likelihood risk of TB treatment failure (AOR=27.81, 95% CI=2.6, 297) compared with patients who don't experienced vomiting, headaches and numbness of the hand and leg after adjusting for other variables (Table 5).

Table 5: Predictors of TB treatment failure in Northern Ethiopia, 2013

Variables	Cases n(%)	Control n(%)	Crude OR (95%CI)	Adjusted OR (95%CI)
Age (years)				
<=19	6(9.4)	30(18.1)	0.47(0.178, 1.24)	0.49(0.16, 1.51)
20-29	11(17.2)	55(33.1)	0.44(0.196, 1.002)	0.5(0.2, 1.28)
30-39	13(20.3)	36(21.7)	0.123(0.028, 0.54)*	0.56(0.028, 0.56)*
40+	34(53.1)	45(27.1)	1	1
Occupation				
Government worker	12(18.8)	32(19.3)	0.48(0.18, 1.26)	0.52(0.18, 1.49)
Private	4(6.2)	9(5.6)	0.57(0.14, 2.25)	0.76(0.17, 3.33)
NGO	1(1.6)	4(2.4)	0.32(0.03, 3.21)	0.28(0.025, 3.18)
Merchant	6(9.4)	15(9)	0.51(0.16, 1.67)	0.38(0.11, 1.32)
Farmer	8(12.5)	31(18.7)	0.33(0.12, 0.94)*	0.248(0.077, 0.8)*
House wife	5(7.8)	10(6)	0.64(0.18, 2.31)	0.47(0.12, 1.87)
Daily laborer	9(14.1)	18(10.8)	0.64(0.22, 1.86)	0.73(0.24, 2.25)
Student	5(7.8)	29(17.5)	0.222(0.068, 0.72)*	0.29(0.074, 1.12)
No job	14(21.9)	18(10.8)	1	1
Number of people live in the same house				
<=2	25(39.1)	67(40.4)	1	1
3-4	31(48.4)	59(35.5)	1.866(0.77, 4.53)	2.2(0.97, 4.94)

>=5	8(12.5)	40(24.1)	2.6(1.09, 6.301)*	1.36(0.58, 3.19)
Duration of cough before TB diagnosis				
<=4 weeks	34(53.1)	110(66.3)	1	1
5-8 weeks	11(17.2)	29(17.5)	1.22(0.55, 2.71)	5.3 (0.51, 55.2)
>=9 weeks	19(29.7)	27(16.3)	2.27(1.13, 4.59)*	86.3(3.82, 1.95)*
Vomiting side effect				
Yes	21(65.6)	21(28.4)	4.82(1.98, 11.7)*	32.9(3.27, 330.2)*
No	11(34.4)	53(71.6)	1	1
Headache side effect				
Yes	19(59.4)	17(23)	4.9(2.01, 11.9)*	7.87(1.3, 47.38)*
No	13(40.6)	57(77)	1	1
Numbness of the hand & legs				
Yes	14(43.8)	3(4.1)	18.4(4.77, 71.02)*	27.81(2.6, 297)*
No	18(56.2)	71(95.9)	1	1

IV. DISCUSSION

Assessment of factors responsible for unsuccessful treatment outcome in DOTS programs is of paramount importance particularly in smear-positive PTB patients as they harbor a highly contagious form of *Microbacterium tuberculosis* that can be monitored for speed of bacteriologic conversion on chemotherapy [13].

Hence, the aim of this study was to assess the determinant factors of tuberculosis treatment failure among smear positive PTB in DOTS program and was assessed at 4 months (new protocol), 5(old) or 7 months of taking TB treatment. Accordingly the factors which were associated with TB treatment failure include: having cough for more than 9 weeks before TB diagnosis, experience of side effect of TB treatments such as vomiting as side effect of TB treatment, patient with headache and patient with numbness of the hand and leg were positively associated with TB treatment failure where as being in age between 30-39 years and being farmers by occupation were a negatively risk factors.

In this study being male or female showed no statistically significant associations for the development of TB treatment failure. However, a study in Addis Ababa found that being male was a risk factor for development of treatment failure [14]. Similarly a study in Nigeria showed that being male was a risk factor for defaulting from anti-TB medication [15]. The reason for the difference may be due to the different in study population between the studies.

Another study showed that individuals who do not take anti-TB medication regularly have increased risk for treatment failure [16]. In our study the bivariate analysis also showed that individuals who missed to take one or more first-line anti-TB drugs whether forgot or intentionally missed had increased risk for development of TB treatment failure. It is also similarly with study conducted in Addis Ababa showed that individuals who did not take first-line anti-TB drugs regularly had increased risk for development of MDR-TB [14]. Other study conducted in Addis Ababa reported

that patients' attitude and behavior towards the disease are major factors influencing treatment adherence [17].

Different studies have shown that poor treatment adherence was a risk factor for MDR-TB [6]. However, the current study showed that individuals who were incomplete the treatment for previous TB infection (history) had no increased risk of developing Treatment failure. In Ethiopia, the previous guideline for first-line anti-TB treatment was 8 months' duration, but the standard has been changed to 6 months. TB therapy requires more than 90% adherence to facilitate cure [18].

In this study, TB drug side effect were significantly associated with TB treatment failure which is similarly with study conducted with Addis Ababa, individuals who encountered drug side effects during the first course of TB treatment had a 4.5 times increased risk of developing MDR-TB [14]. Studies done in three districts of Arsi Zone, Ethiopia, found that anti-TB drug side effects were significantly associated with a high rate of defaulting [19]. When patients develop side effects, they tend to stop treatment, which favors the development of TB treatment failure. If the DOTS strategy of the nation were followed in all cases, there would be a chance to counsel patients and even treat adverse drug reactions before treatment interruption.

As it is known, coming early to health institutions to make TB diagnosis at the start of the symptoms has strong relationship with the successfulness of any treatment rather than coming after becoming severely complications. Having this, in this study individuals who had 9 weeks and more cough before TB diagnosis were risk factor for TB treatment failure.

In the current study, being age 40 years and above compared to age between 30-39 years had higher risk of TB treatment failure. Similarly a cross sectional study in Tigray showed that the risk of unsuccessful treatment outcome was 2.5 (95% CI: 1.12-5.59) times higher among PTB patients older than 40 years of age compared to those aged 15-40 years [13]. Similarly another study in Thailand showed that an age of above 60 years was significantly correlated with treatment interruption and treatment failure [20].

(adjusted OR = 3.10, 95% CI: 1.33-7.24) unsuccessful outcome when compared to their counterparts [13]. This is consistence with the current study that having no job has higher risk of TB treatment failure than farmer.

In this study previous history of both self and family member TB infection and treatment has statistical significant at bivariate level but not significant in the multiple logistic regression model. Similarly in study in Ethiopia showed that that having more than one TB episode also increased risk for TB treatment failure. This may be related to the previous treatment outcome, default, treatment failure, or relapse, or the patient may have had MDR-TB initially. A systematic review of 29 published reports on risk factors associated with TB treatment failure in Europe revealed that previous treatment was the strongest determinant of MDR-TB and that the pooled risk of TB treatment failure was 10.23 times higher in previously treated than in never-treated cases [21]. A study in Uganda also showed that multiple TB episodes and treatment failure were significantly associated with treatment failure [22]. Similarly, in Ethiopia, according to a nationwide anti-TB drug resistance survey conducted in 2005, 1.6% of newly diagnosed TB cases were infected with MDR-TB, while 11.8% of the MDR-TB cases were previously treated TB cases.

In the current study, HIV status had no significant association with TB treatment failure. A study in Thailand and Addis Ababa showed also that HIV status was not significantly associated with TB treatment failure [23, 2]. A study in Ukraine showed that HIV-positive individuals had a 50% higher risk of developing TB treatment failure at their first TB infection [24]. This is because being HIV positive is one risk factor for drug-susceptible TB, which is related to immune system suppression. Being HIV positive might carry the same risk of infection with MDR-TB but may not contribute to the change of a drug-susceptible strain of TB to MDR-TB.

In current study marital status, residence, distance from treatment center, number of rooms in house, educational status, ever smoking cigarette were no risk factors for the development of TB treatment failures, which is similar in study conducted in Addis Ababa and Tigray [14, 13]. As limitation, in this study the sample size was small which makes to generalizing findings due to the cases were very rare events and difficult to get a patient with treatment failure after DOTs during the 9 months study periods. In addition, there may be also a interviewer bias since the data collectors were recruited from the health facilities. So, it is better to consider in interpretation of this findings. As strength, the design of the study is unique in trying to minimize potential bias by using the unconditional cases and controls. Used standard structured questionnaire adapted from different literatures and considers all

factors from patient, health provider, and medical practice sides.

V. CONCLUSION

Forgetting to take TB drug, missing TB drug intentional due to different reasons and taking different treatment drugs for other medical problems during the course of TB treatment drug cause more risk of experiencing TB treatment failure. Being in age group between 30-39 years had reduced likely hood of risk of TB treatment failure compared to those 40 years old and similarly being farmers by occupation were a reduction likelihood of risk compared with a person with no job. Subjects who had more than 9 weeks cough before TB diagnosis were more likely to have treatment failure compared with those who had less than 4 week cough. Subject who experience vomiting, head ache and numbness of the hand and leg as side effect of TB treatment had more likely risk to TB treatment failure compared with patients who don't experienced vomiting, headaches and numbness of the hand and leg after TB treatment. Considering this, early treatment of TB, giving especial care to older patients and possible and appropriate sustained activities to bring behavior change regarding effective use of drug at home during the continuation phase are important interventions. In addition, there should be a system for regular supervision, follow-up training and means of quality control and possible referral system for patient with treatment failure.

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a) Authors' contributions

. GF: BE: KH: MA: has taken a principal role in the conception of ideas, developing methodologies and writing the article. And they Involves in data collection, analysis, interpretation of the data, preparing the manuscript and final accepted the final manuscript.

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Thrombocytopenia as a Clue of Vivax Malaria in Endemic Region, Sudan

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Abstract- Reduction in circulating platelets is observed relatively frequently in cases of malaria due to *P. vivax*. 61 patients with confirmed vivax malaria were enrolled in this study and the platelets were counted by hematological analyzer. our study revealed that 77.1% had platelets count less than 150,000/ μ l , thrombocytopenia grade 1 represent 43%, grade 2 represent 19.8%, grade 3 represent 9.8% and grade 4 represent 4.9%. Thrombocytopenia should be a consideration as a clue to the presence of malaria in endemic region.

Keywords: *vivax malaria; thrombocytopenia; sudan.*

GJMR-F Classification : *FOR Code : WH 315, WC 750*



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Abstract- Reduction in circulating platelets is observed relatively frequently in cases of malaria due to *P. vivax*. 61 patients with confirmed vivax malaria were enrolled in this study and the platelets were counted by hematological analyzer. our study revealed that 77.1% had platelets count less than 150,000/ μl , thrombocytopenia grade 1 represent 43%, grade 2 represent 19.8%, grade 3 represent 9.8% and grade 4 represent 4.9%. Thrombocytopenia should be a consideration as a clue to the presence of malaria in endemic region.

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I. INTRODUCTION

Plasmodium vivax cause a major global health problem in endemic regions, this species of parasite has the broadest geographic distribution of the five malaria species known to infect humans (Guerra *et al* 2009). There are about 2.85 billion people at risk of malaria and an estimated 80 to 300 million clinical cases of *P. vivax* annually (Guerra CA *et al* 2009, Mendis K *et al* 2001). Although *P. vivax* is mainly endemic in Southeast Asia and Latin America (Mueller I *et al* 2009) but, *P. vivax* was recently increased in Sudan and Ethiopia (Yohannes AM *et al* 2011, Abdalla SI *et al* 2007). *P. vivax* represent 6.1% of malaria cases in Central and Eastern Sudan (Albadawi A. Talha 2014). Malaria is one of the leading causes of morbidity and mortality in Sudan. Reported malaria cases account for 9.3% of outpatients' clinic visits and approximately 8.7% of hospital admissions. The malaria mortality is about 2.6% and fatality rate about 0.64% (FMOH 2014). Malaria is commonly associated with various degrees of hematological complications like anemia and thrombocytopenia. The anemia is usually due to varied reasons ranging from haemolysis to other complications like parasitic infections, folate, iron, and vitamin B12 deficiencies in endemic areas, antimalarials and further complicated by the coexistence of thalassemia and other haemoglobinopathies [K. Ghosh and K. Ghosh 2007, S. N. Wickramasinghe *et al* 2000].

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Thrombocytopenia is reported especially in severe *P. falciparum* malaria and few reports in isolated *P. vivax* infection [Pal Singh Makkar 2002]. Thrombocytopenia is less studied in vivax malaria causes negligible of hidden mortality. The pathogenesis of thrombocytopenia in malaria is unclear, although increased platelet destruction rather than decreased production appears to be responsible [Piguet P. F. *et al* 2002]. In general, the underlying mechanisms of thrombocytopenia in malaria are peripheral destruction, excessive sequestration of platelets in spleen, and excessive use of platelets associated with the disseminated intravascular coagulation phenomenon [Gupta NK *et al*, 2013]. In addition to the reduction in the number of platelets, platelet function is also compromised in malaria [Greisenegger S, *et al* 2004]. In most laboratories, a normal platelet count is between 150,000 to 450,000/ μl . By definition, 5% of the population will have counts outside the "normal" range. No generally accepted definition of mild, moderate or severe thrombocytopenia exists. For cancer patients receiving treatment, the National Cancer Institute (NCI) has developed the Common Toxicity Criteria to describe severity of thrombocytopenia. Platelet counts of 75,000 to 150,000/ μl are defined as grade 1 thrombocytopenia, 50,000 to <75,000/ μl as grade 2, 25,000 to <50,000/ μl as grade 3, and below 25,000/ μl as grade 4 thrombocytopenia. (CTCAE v3.0; www.ctep.cancer.gov/reporting/ctc.html), here we use this criteria for the classification of thrombocytopenia in vivax malaria patients.

II. PATIENTS AND METHODS

It was a cross sectional observational, hospital based study conducted at Wad Medani Paediatric teaching hospital and Wad Medani teaching hospital in central Sudan. All patients with vivax malaria presenting to the two hospitals during August 2013 to December 2013 were included in the study after written consent. The thick and thin blood smears were prepared and stained with Giemsa according to the WHO guidelines and studied by a medical parasitologist. and the platelets counts were done by an auto analyzer machine (Hematological analyser SysMix-KXN21, Roche, German) and rechecked by peripheral blood smear. Platelet counts of 75,000 to 150,000/dL are defined as grade 1 thrombocytopenia, 50,000 to <75,000/dL as grade 2, 25,000 to <50,000/dL as grade 3, and below

25,000/dL as grade 4 thrombocytopenia according to NCI criteria.

III. RESULT

Sixty one Thin & Thick blood film from febrile cases showed positive *P. vivax* mono-infection by light microscope and the parasitaemia ranged from 1,070 to 42,800 parasites / μ l of blood, most of the cases have different asexual stages from young trophozoite to

schizont. The mean of platelets count were 112,016 / μ l. And (47/61 77.1%) of total cases had platelets count < 150,000/ μ l. About 14.7% of total cases had platelets count \leq 50,000 / μ l. Three patients had platelets count 14,000, 12,000 and 9,000 / μ l respectively. Statistically no correlation was found between the severity of thrombocytopenia and parasite count. The severity of thrombocytopenia according to NCI criteria were indicated in table 1.

Table 1 : Thrombocytopenia using NCI score and mean parasite count in patients infected with vivax malaria

Platelets grade	N-of patients (%)	Mean of parasite count/ μ l
> 75,000 > 150,000	26 (43%)	10338
> 50,000 < 75,000	12(19.8)	14283
> 25,000 < 50,000	6 (9.8%)	13671
< 25,000	3(4.9%)	4096

IV. DISCUSSION

Thrombocytopenia is very common in severe falciparum malaria [M.N. Akhtar et al 2005, Z. U. Rehman et al 1999]. Some studies have shown that thrombocytopenia is equally or even more common in *P. vivax* malaria in contrast to the popular observation in *P. falciparum* malaria [A. Aggarwal et al 2005, A. Kumar and Shashirekha 2006]. Our study revealed that 77.1% had platelets count less than 150,000/ μ l, thrombocytopenia grade 1 represent 43%, grade 2 represent 19.8%, grade 3 represent 9.8% and grade 4 represent 4.9%. Mild reduction in circulating platelets is observed relatively frequently in cases of malaria due to *P. vivax* but cases of severe thrombocytopenia are quite rare. (Daily JP et al 2003). Similar study of 101 symptomatic patients with vivax malaria revealed that 85% had platelet counts less than 150,000/ μ l (Oh M-D et al 2001) Published data in India has shown thrombocytopenia among patients with *P. vivax* infection [D. K. Kochar et al 2010]. A studies conducted from the Indian have found significant thrombocytopenia in *P. vivax* malaria [S. Srivastava et al 2011, P. George and L. M. Alexander et al 2010]. Similar results have been reported from Qatar and Venezuela [F. Yousef Khan et al 2009, B. Gonz'alez et al 2009]. In Horstmann's series [Horstmann R.D et al 1991], the lowest count of platelets in 39 cases of vivax malaria was 44,000/ μ l. Pukrittayakamee et al described a case of a volunteer experimentally infected with the Chesson's strain of *P. vivax* with a platelet count of 20,000/ μ l [Pukrittayakamee S et al 1989]. Also a case of vivax malaria associated with an initial platelet count of 5,000/ μ l was reported from India [Kakar A et al 1999]. Studies from Brazil have shown a similar result [S. B. R. Silva et al 2009]. A study from Iran confirms that they are getting more cases of thrombocytopenia due to *P. vivax* than Falciparum and attributes this to the possible development of a new genotype of *P. vivax* [M. Metanat and B. Sharifi-Mood 2010]. Thrombocytopenia were found in most cases

with acute vivax malaria (A. Kumar and Shashirekha 2006, A. Aggarwal, S. Rath, and Shashiraj 2005). In this study statistically no correlation was found between the severity of thrombocytopenia and parasite count, it is similar to the study conducted by Dhanpat Kumar Kochar et al [Dhanpat Kumar Kochar et al 2012]. The thrombocytopenia that found in most cases in this study and profound thrombocytopenia may indicated that the traditional view of vivax malaria as benign infection were changed as vivax malaria can cause severe manifestations.

V. CONCLUSION

Thrombocytopenia should be a consideration as a clue to the presence of malaria in endemic region and after excluding this easily treatable cause, further evaluation of thrombocytopenia should be undertaken.

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Prevention Practices from water Borne Diseases Within Households in the Bamendankwe Municipality-North West Cameroon

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The research question for the study was: What knowledge do households in Bamendankwe village possess in the practice of the prevention of water-borne diseases and what measures are employed in the prevention of the occurrence of water-borne diseases?

Keywords: *waterborne diseases, cholera, typhoid fever, dysentery, purification, chlorination, dehydration, diarrhea.*

GJMR-F Classification : *FOR Code : WC 600*



PREVENTION PRACTICES FROM WATER BORNE DISEASES WITH IN HOUSEHOLDS IN THE BAMENDANKWE MUNICIPALITY IN NORTH WEST CAMEROON

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Prevention Practices from water Borne Diseases within Households in the Bamendankwe Municipality-North West Cameroon

Bodzewan Emmanuel Fonyuy^α & Mr. Lange Innocent^σ

Abstract- In the developing countries four-fifth of all the illnesses are caused by water-borne diseases with diarrhoea leading to dehydration being the leading cause of childhood death.

Cholera, typhoid fever and hepatitis A are caused by bacteria, and are among the most common diarrheal diseases. Other illnesses, such as dysentery, are caused by parasites that live in water contaminated by the feces of sick individuals. The most common manifestation and cause of mortality in water borne diseases were as result of dehydration due to loss of copious amounts of electrolytes either in vomiting or diarrhea.

The research question for the study was: What knowledge do households in Bamendankwe village possess in the practice of the prevention of water-borne diseases and what measures are employed in the prevention of the occurrence of water-borne diseases?

The general objective was to assess the knowledge and practices of households in Bamendakwe municipality in the prevention of the occurrence of water-borne diseases; identify the problems encountered in its prevention and ascertain practical measures to be employed to resolve their occurrence.

The specific objectives were: to assess the knowledge of households on the causes of water borne diseases; to determine the practical measures put in place to prevent the occurrence of water borne diseases; to identify the problems they face in the practice of the preventive measures against water borne diseases and to ascertain opinions of households on how to resolve difficulties/constraints in the implementation of preventive measures against water borne diseases.

The descriptive cross-sectional study design was employed for the study where-in primary data was collected at one point in time from inhabitants of Bamendankwe municipality in order to collect responses on their knowledge and practices in the prevention of waterborne diseases as well as the constraints encountered in the prevention of its occurrence.

The target population for this study comprised of youths, men and women who have lived in this village within the past 6 months irrespective of their sex, religion, occupation, nationality and socio-economic status.

A sample size of 120 respondents was recruited for the study.

Results show that out 120 respondents, 44 (37%) had basic education, 40(33%) went to secondary school and 36 (30%) attained university education. Eighty (67%)

said water borne diseases were diseases transmitted by pathogenic micro-organisms, 40(33%) said that water borne diseases were diseases caused by drinking water from doubtful sources.

They gave diverse responses as to the different types of waterborne diseases; with 18 (18%) out of the 60(60%) knew of typhoid, 15(25%) named cholera, 12(20%) talked of diarrhoea, 10(17%) point out malaria and 5(8%) of the 60 knew of dysentery.

Concerning the complications that ensue from waterborne pathologies, 40(33.3%) said severe dehydration can result as a complication of water borne diseases, 32 (26.6%), 40(33.3%) said death can result while 08 (6.6%) said it can result to hypovolemia.

Thirty-six (30%) of respondents both faced financial and educational constraints in the prevention of water diseases, 30(25%) said they lack time, and 18 (15%) said it was difficult due to lack of community water project.

Diverse proposal were made to salvage the encountered problems; 20% proposed frequent hand-washing, 25% proposed keeping containers always clean, 22% proposed the construction of pipe-borne stand-pipes, 17% proposed health educational lectures on waterborne diseases while 6% wished filters be provided in homes.

From the data collected, and analysis made it be can be concluded that there exist knowledge deficit on the causes of water-borne diseases as well as the practical measures employed in the prevention of their occurrence as evidenced by the diverse responses gotten from them. Their understanding of the notions of hygiene and sanitation, the knowledge and practices on the prevention of water-borne diseases were not based on the level of education but on how much information they got via public health education concerning the causes and preventive measures of water-borne diseases.

So, an up-to-date knowledge and practices on the prevention of the occurrence of water-borne diseases through corporate approach by stakeholders is necessary for the wellbeing of the Bamendankwe community. The Bamendankwe Council hygiene and sanitation officers should take it a responsibility to organize regular household checks for the availability of properly constructed toilet facilities in homes and equally provide public health education lectures in social institutions in order to enlighten the community on the importance of constructing appropriate toilets with lids at a satisfactory distance from the households to avoid flies contaminating foodstuffs.

Keywords: waterborne diseases, cholera, typhoid fever, dysentery, purification, chlorination, dehydration, diarrhea.

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I. INTRODUCTION

Around 1.1 billion people worldwide do not have access to improved water supply sources, where as 2.4 billion people do not have access to any type of improved sanitation facilities. About 2 million people die every year due to diarrheal-related diseases most of whom are children less than 5 years of age. The most affected are people of the developing countries living in extreme condition of poverty, normally peri-urban dwellers or rural inhabitants.

According to WHO (2014), every year more than 3.4 million people die as a result of water-related diseases, making it the leading cause of morbidity and mortality around the world. Most of the victims are young children, the vast majority of whom die of illnesses caused by organisms that thrive in water sources contaminated by raw sewage. A report published recently in the medical journal *The Lancet*, (2005) concluded that poor water sanitation and lack of safe drinking water take a greater human toll than war, terrorism and weapons of mass destruction combined. Among the main problems which are responsible for this situation were;

- Lack of priority given to the sector;
- Lack of financial resources;
- Lack of water supply and sanitation services;
- Poor hygiene behaviors and inadequate sanitation in public places including hospitals, health centers and schools providing access to sufficient quantities of safe water.

The provision of facilities for sanitary disposal of excreta and introducing sound hygiene behaviors, are of capital importance to reduce the burden of disease caused by these risk factors.

According to an assessment commissioned by the United Nations, 4,000 children die each day as a result of diseases caused by ingestion of filthy water. The report says four out of every 10 people in the world, particularly those in Africa and Asia, do not have clean water to drink.

Cholera, typhoid fever and hepatitis A are caused by bacteria, and are among the most common diarrheal diseases. Other illnesses, such as dysentery, are caused by parasites that live in water contaminated by the feces of sick individuals. The most common manifestation and cause of mortality in water borne diseases were as result of dehydration due to loss of copious amounts of electrolytes either in vomiting or diarrhea.

Lakes and streams which people use for drinking water, bathing and defecating are sources of disease, as is water left by natural disasters.

People can also contract a diarrheal disease by eating food that's prepared by sick individuals who have not washed their hands, or touching something handled by an infected person and then putting their own hands into their mouths.

Water borne diseases occurrence was observed to follow a seasonal pattern with peaks occurring between the months of January and May, followed by drops between June and October and rose again in November. Children below 5 years were found to be more vulnerable to diarrhoea of viral origin, gastro-enteritis and amoebic dysentery while persons between 15-44 years were more vulnerable to typhoid and cholera (WHO, 2010).

Physical and chemical analysis revealed that water samples had turbidities varying between 5.5-86 NTU, pH values between 4.2 and 7.1 and zero residual chlorine. Bacteriological analysis showed that the total coli forms count was averagely 74/100ml, the fecal coli form count was 43/100ml and the fecal streptococci count was 27/100ml. Lack of access to portable water, absence of sanitation facilities and environmental factors could be advanced as the probable causes of water borne diseases spread.

In the developing countries four-fifth of all the illnesses are caused by water-borne diseases with diarrhoea leading to dehydration being the leading cause of childhood death. An estimated 246.7 million people worldwide are infected with schistosomiasis and out of these, 20 million suffer severe consequences of the infection while 120 million suffer neither symptom. An estimated 80% of the transmission takes place in Africa south of the Sahara.

The United Nations has set a goal of cutting in half by the year 2015 the number of people without access to safe drinking water and basic sanitation. Independent experts say that a concerted effort on the part of wealthier nations is necessary if that goal is to be reached.

A study carried out in the Bamendakwe municipality, revealed that out of 2124 people who were consulted from March to June 2013, 1200 (56.5%) were cases of water borne diseases. Besides, absence of adequate toilet facilities, poorly constructed latrines with no lids to prevent flies from visiting the toilets and picking faecal matter on their appendages to contaminate foods and cooking utensils is another problem faced in the prevention of water borne diseases. This is because most families do not have good toilets facilities; the hygiene and sanitation officers of the rural municipalities do not do regular checks in homes to identify defaulters who do not have good toilet facilities or with toilets too close to households and judicious sanctions meted on them. In the hinterlands some inhabitants used pig fence as their toilets, others used rivers as their toilet thus polluting water thereby causing water borne infections for those using it downstream (Meinhardt, 2007).

More so, the lack of trained personnel to carryout health education on its prevention is another problem. This is because communities lack educators to educate them on the dangers of water borne diseases

there by influencing the health status of the people (Strausbaugh, 1997).

Besides, another problem faced in the developing countries is that of lack of water project schemes; since most communities do not have water projects they turn to use water from doubtful sources there by increasing the rate of water borne diseases in Africa. (Gerba *et al*, 2010)

Furthermore, poor hand washing method is another problem faced in the prevention of water borne diseases. People tend to transmit infection from one another through the faeco-oral route as they do not master the appropriate method of hand washing after visiting the toilet (Meinhardt et al, 2007).

The community water catchment site are not fenced rendering easy access by stray animals that ended up contaminating sources of water supply. This was the main source of motivation for the researcher to carry out research on the knowledge and practices of families in the proper handling measures of portable water in order to prevent the occurrence of water-borne diseases.

b) *Research Question*

What knowledge do households in Bamendankwe village possess in the practice of the prevention of water-borne diseases, and what measures are employed in the prevention of the occurrence of water-borne diseases?

c) *Research Objectives*

i. *General Objective*

To assess the knowledge and practices of households in Bamendakwe village in the prevention of the occurrence of water-borne diseases; identify the problems encountered in its prevention and ascertain practical measures to be employed to resolve their occurrence.

ii. *Specific Objectives*

1. To assess the knowledge of households on the causes of water borne diseases.
2. To determine the practical measures put in place to prevent the occurrence of water borne diseases.
3. To identify the problems they face in the practice of the preventive measures against water borne diseases.
4. To ascertain opinions of households on how to resolve difficulties/constraints in the implementation of preventive measures against water borne diseases.

II. METHODOLOGY

a) *Study Design*

The descriptive cross-sectional study design was employed for the study where-in primary data was

collected at one point in time from inhabitants of Bamendankwe village in order to collect responses on their knowledge and practices in the prevention of waterborne diseases as well as the constraints encountered in the prevention of its occurrence.

The target population for this study comprised of youths, men and women who have lived in this village within the past 6 months irrespective of their sex, religion, occupation, nationality and socio-economic status.

Sample Size: The sample size was calculated using the formula below:

$$N = \frac{(z)^2 \times p(1-p)}{(e)^2}$$

Where,

- N= the required sample size
- Z= confidence interval of 95% (z=1.96)
- p = the population of households (15%)
- e = random error of 5% (type 1 value of 0.05)
- N= 120 respondents.

b) *Primary Data Collection Instrument*

The instrument employed for primary data collection was a structured questionnaire with open and close-ended questions, administered by the researcher and co-researchers to the study population in the randomly selected quarters using the cluster sampling method.

c) *Data Analysis Tools*

Data was coded using a coding guide developed for the study and entered in CsPro, cleaned and exported to SPSS windows version 16.0 for analysis.

- Descriptive statistics was employed to analyze the households' perceptions and practices.
- Bivariate analysis was used to evaluate the association between explanatory and outcome variables;

d) *Data Presentation Method*

Data collected was analyzed using the above software and presented in graphics and frequency tables.

III. PRESENTATION AND ANALYSIS OF DATA

a) *Age distribution of respondents*

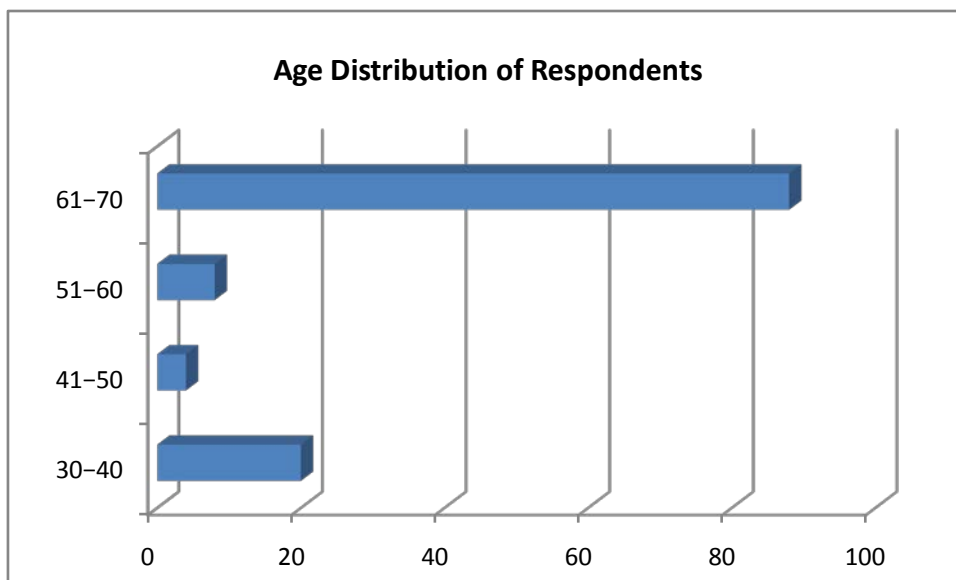


Figure 1 : Age distribution of Respondents

In figure 1 above, out of 120 respondents, 88(73%) were within the age range 61–70 years, 20(17%) within the range 30–40 years, 8(7.0%) within the range 51–60 and 4(3.0%) within the age range 41–50 years.

b) *Sex distribution of respondents*

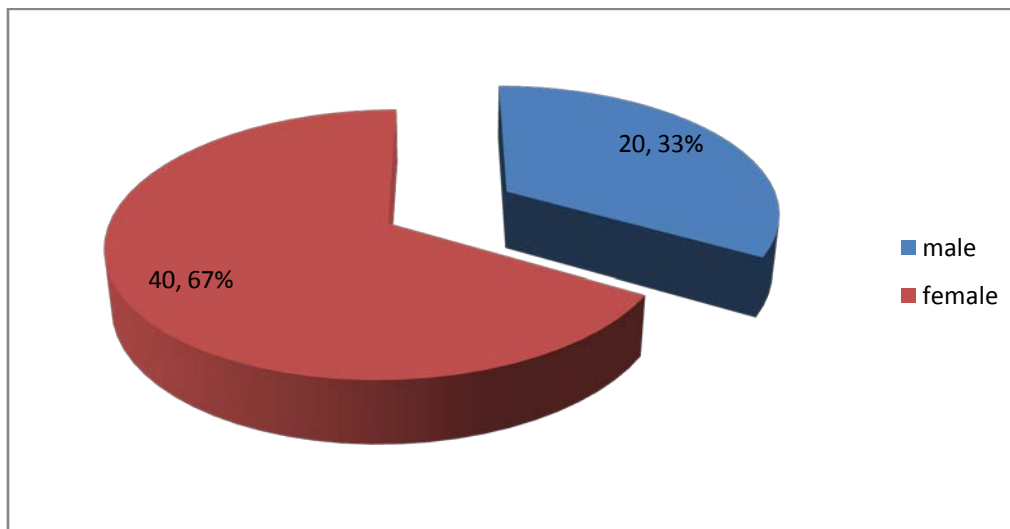


Figure 2 : Sex distribution of respondents.

Out of 120 respondents, 80(67%) were females, while 20(33%) were males.



c) *Distribution of respondents according to marital status*

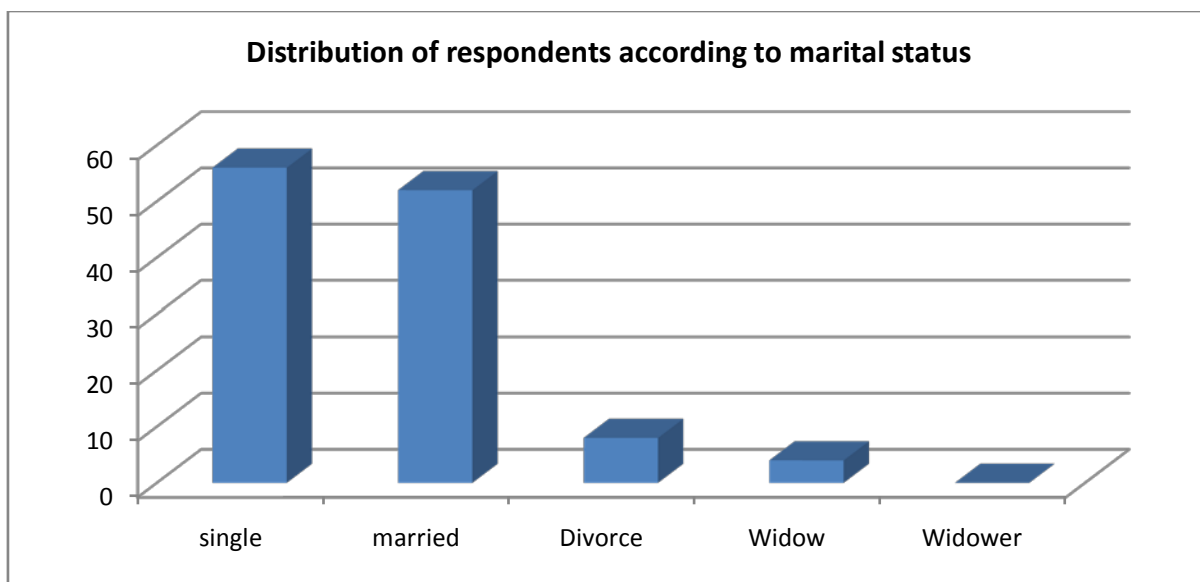


Figure 3 : Distribution of respondents according to marital status

From figure 3, 56 (47%) were single, 52 (43%) married 8 (7%) divorce and 4.0 (3%) were widows.

d) *Distribution of respondents according to educational level*

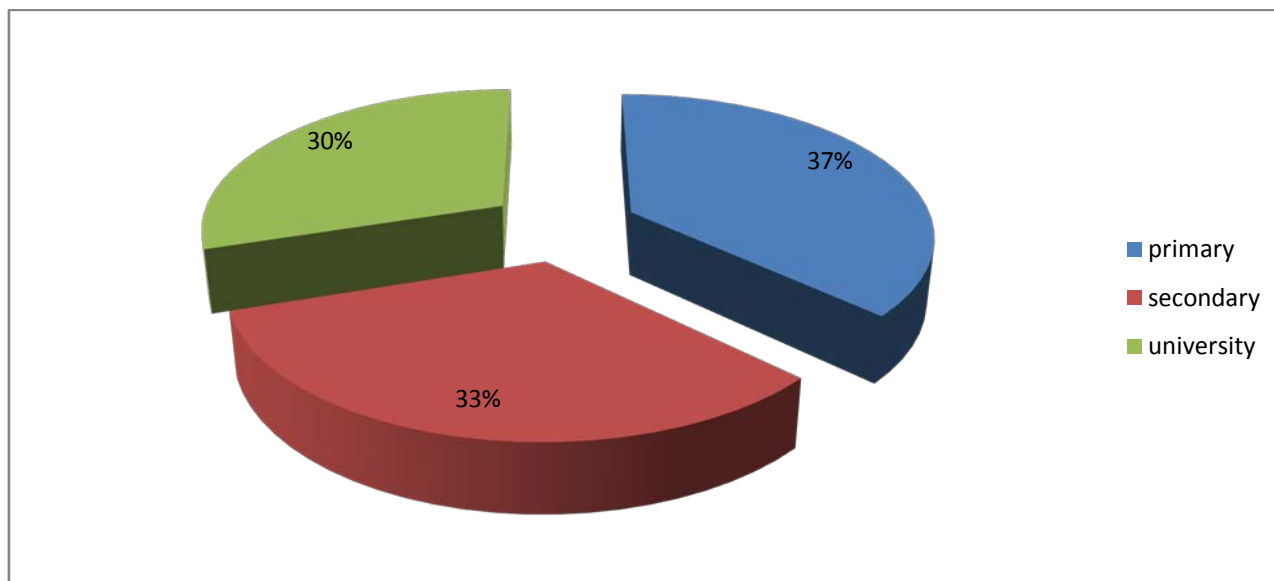


Figure 4 : Frequency distribution of respondents according to educational level

Out 120 respondents, 44 (37%) had basic education, 40(33%) went to secondary school and 36 (30%) attained university education.



e) Knowledge on the causes and occurrence of water borne diseases

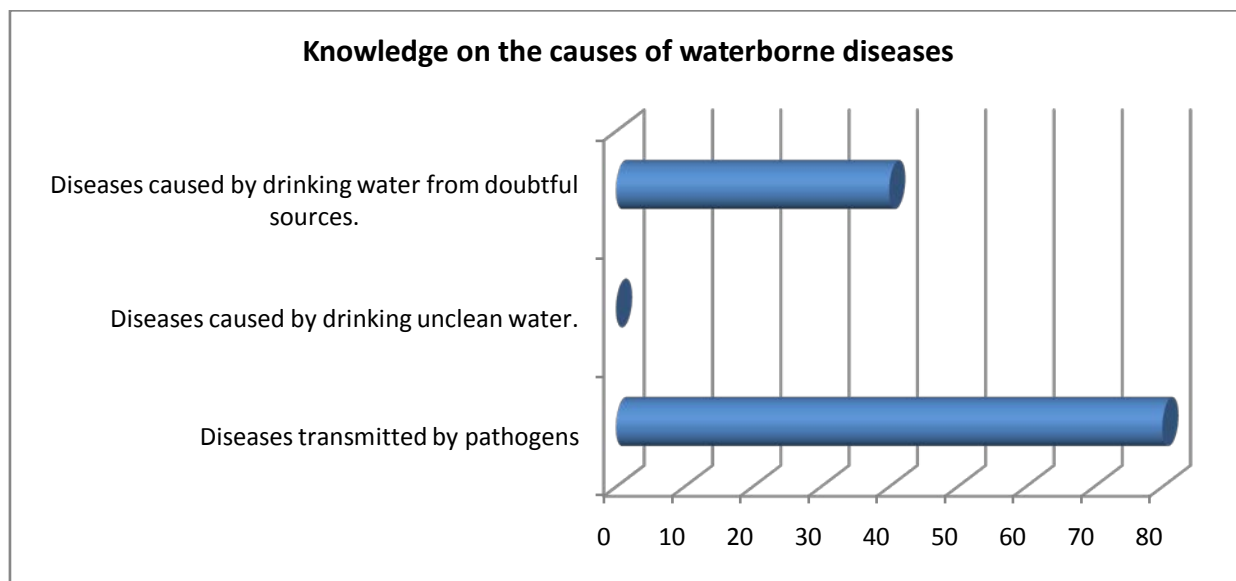


Figure 5: Respondents' knowledge on the causes of water borne diseases

From figure 5, 80(67%) said water borne diseases were diseases transmitted by pathogenic micro-organisms, 40(33%) said that water borne diseases were diseases caused by drinking water from doubtful sources.

f) Knowledge on the transmission of water borne diseases

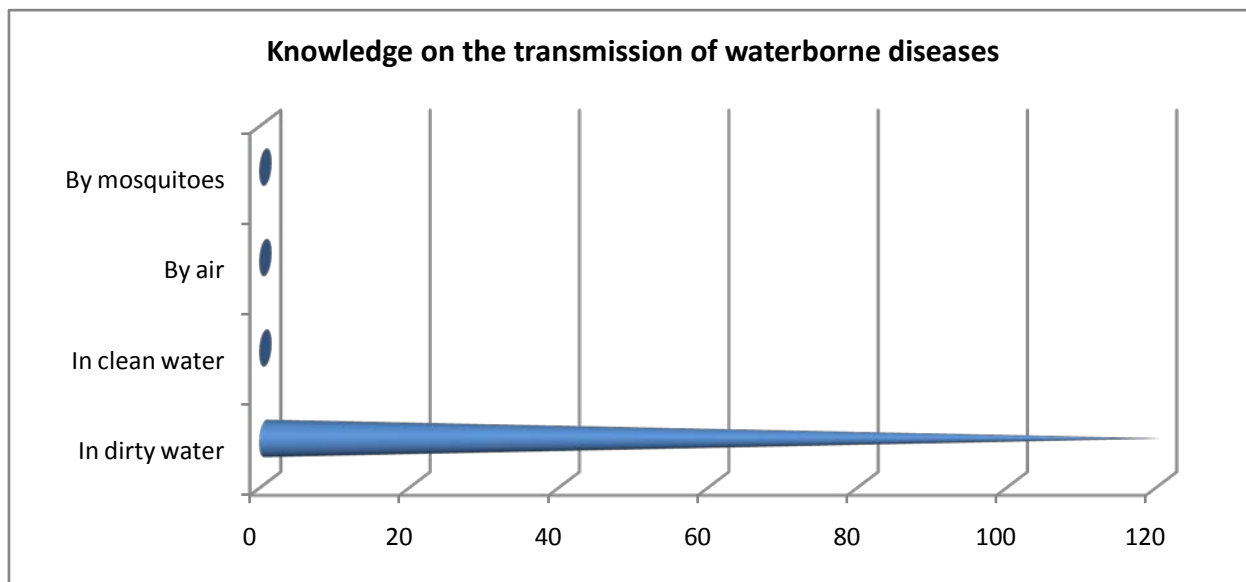


Figure 6: Respondent's knowledge on the transmission of water borne diseases

All the 120 respondents said water borne diseases were transmitted by consuming water contaminated by pathogenic micro-organisms.

g) Knowledge on the types of waterborne diseases

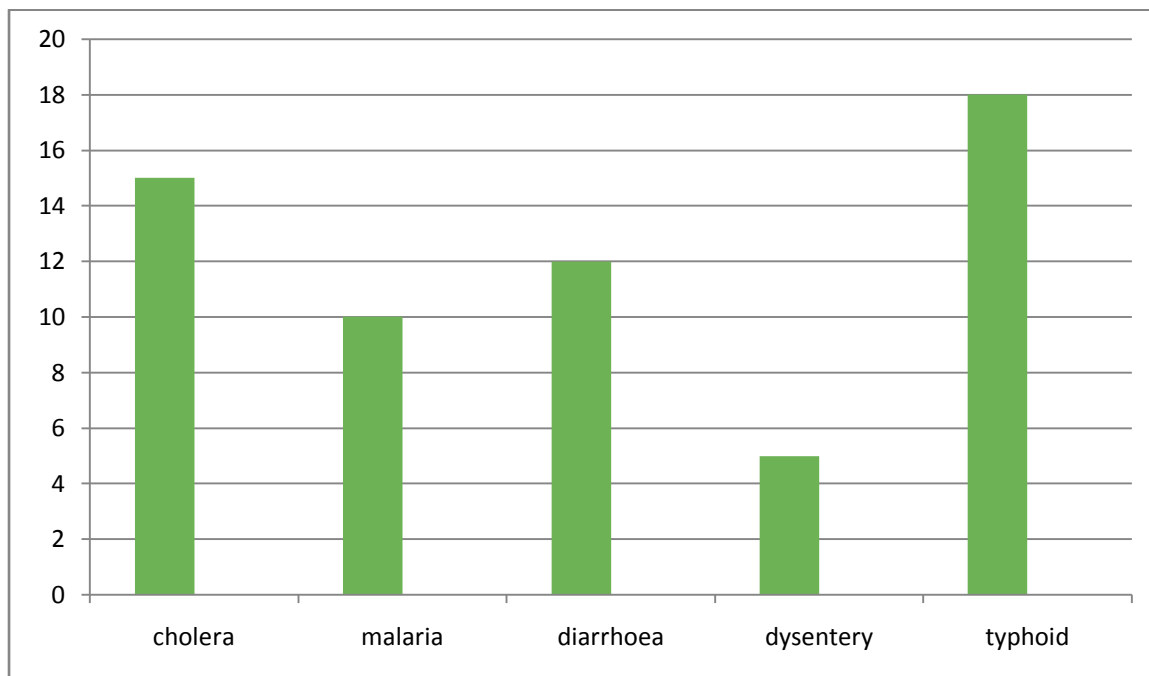


Figure 7: Respondents' knowledge on the types of waterborne diseases

Respondents gave diverse responses to the different types of waterborne diseases contracted from consuming water from doubtful sources; 18 (18%) out of the 60(60%) knew of typhoid, 15(25%) named cholera, 12(20%) talked of diarrhoea, 10(17%) point out malaria and 5(8%) out of the 60 knew of dysentery.

h) Knowledge on the transmission of water borne diseases

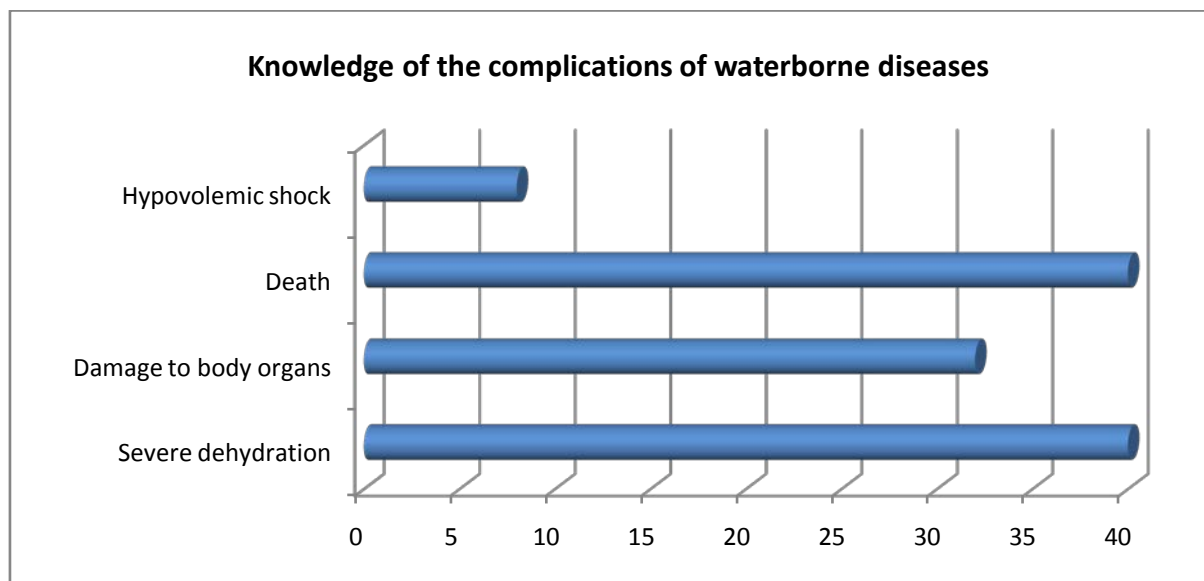


Figure 8: Knowledge of the complications of waterborne diseases

According to figure 8, 40(33.3%) said severe dehydration can result as a complication of water borne diseases, 32 (26.6%), 40(33.3%) said death can result while 08 (6.6%) said it can result to hypovolemia.

i) Knowledge on the prevention of water borne diseases

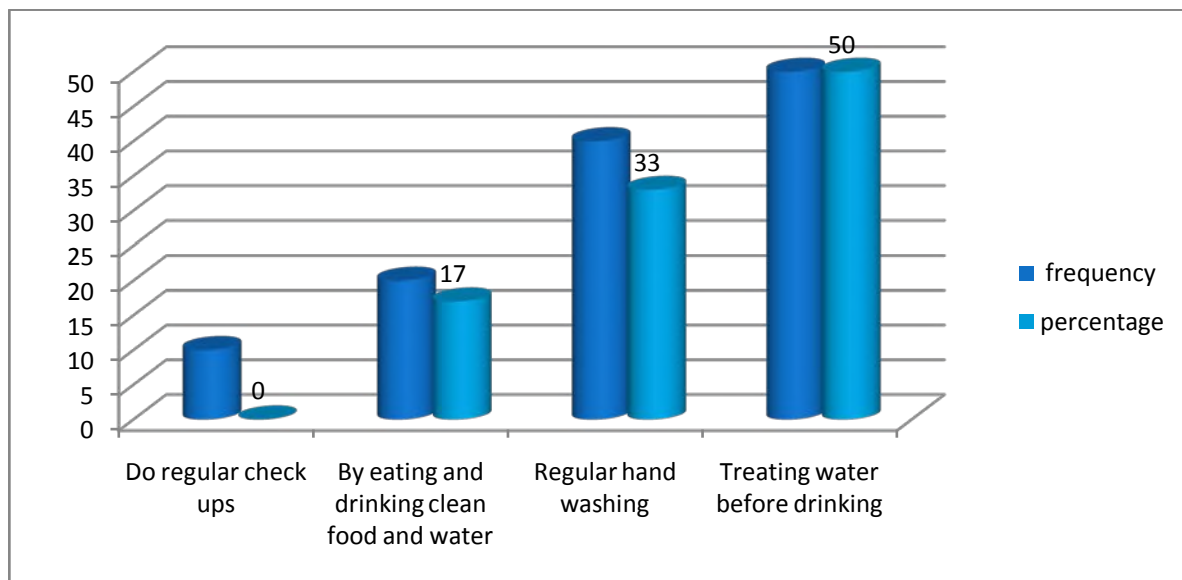


Figure 9: Respondents' preventive measures against water borne diseases

From figure 9, 50% of respondents prevent water borne diseases by treating their water with chlorine before drinking, 33% prevent it by regular hand washing and 17% said water borne diseases can be prevented by eating clean food and drinking clean water.

j) Respondents' sources of portable water

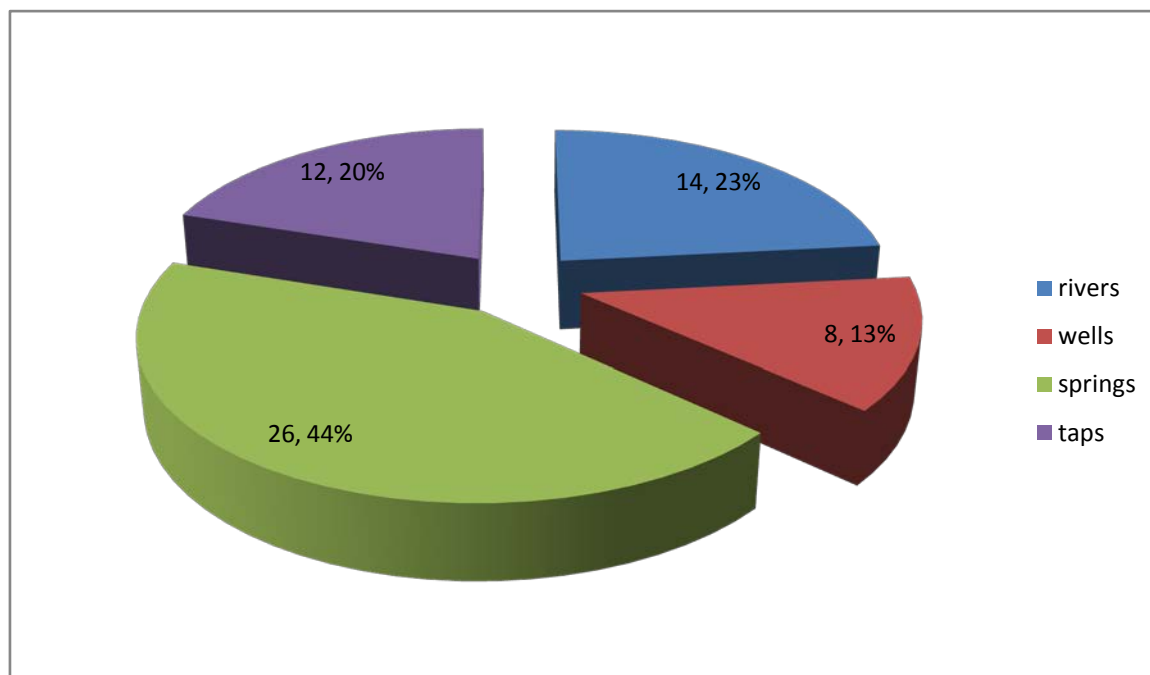


Figure 10: Respondents' sources of portable water

Figure 10 presents the respondents' sources of drinking water; 52(43%) of respondents consumed water from springs, 28(23%) consumed water from rivers, 24(21%) used water from taps while 16(13%) relied on well water as a source of drinking water.

k) Constraints encountered in the prevention of waterborne diseases

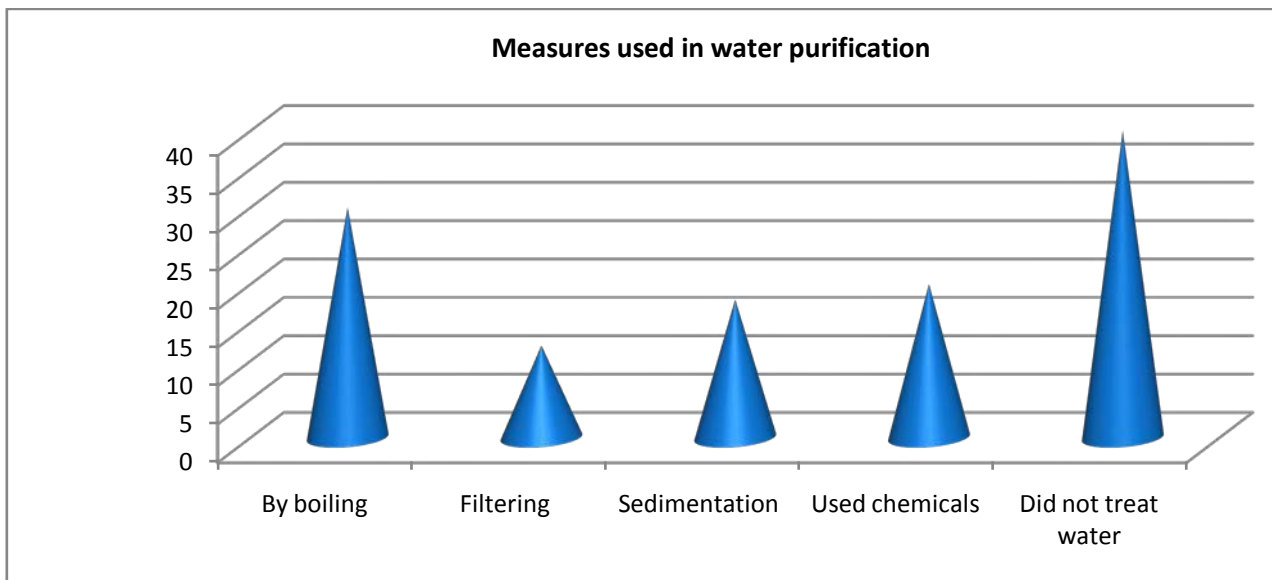


Figure 11: Measures used in water purification

In figure 11, 40(33%) did not treat their water, 30(25%) treated water by boiling, 20(17%) used chemicals to treat their water, 18(15%) managed to sediment their water and 12(10%) said they filtered their water before drinking.

l) Respondents' opinions on how to resolve the identified problems

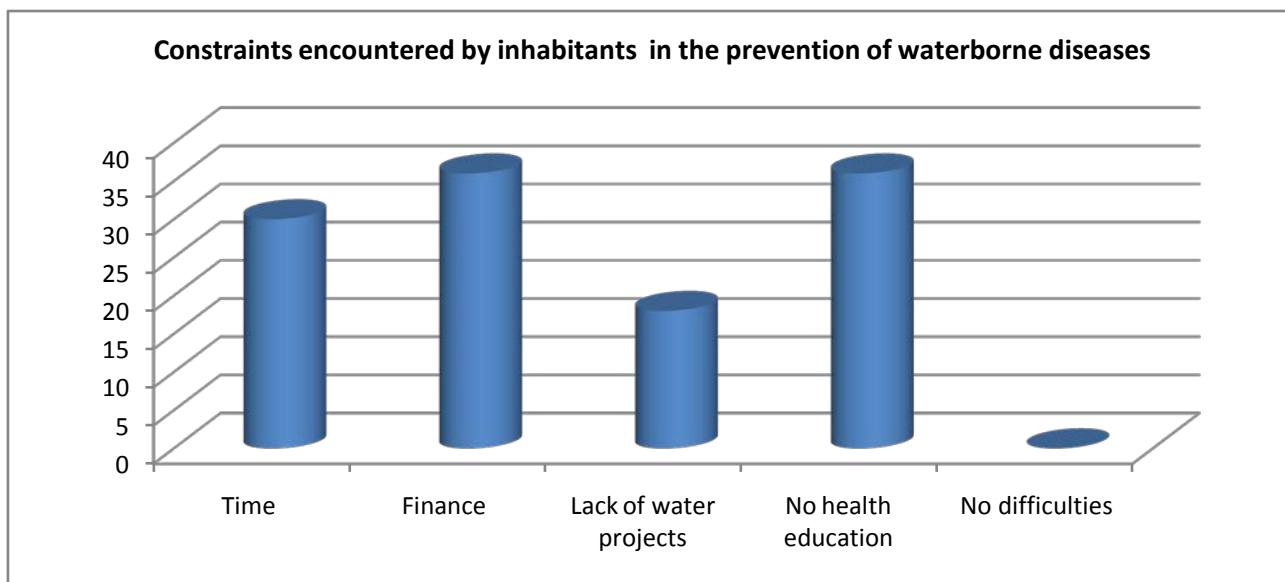


Figure 12: Distribution of respondents according to constraints faced in the prevention of water borne diseases

In figure 12, 36(30%) of respondents both faced financial and educational constraints in the prevention of water diseases, 30(25%) said they lack time, and 18 (15%) say it was difficult due to lack of community water project.

m) Respondents' opinions on how to resolve the identified problems

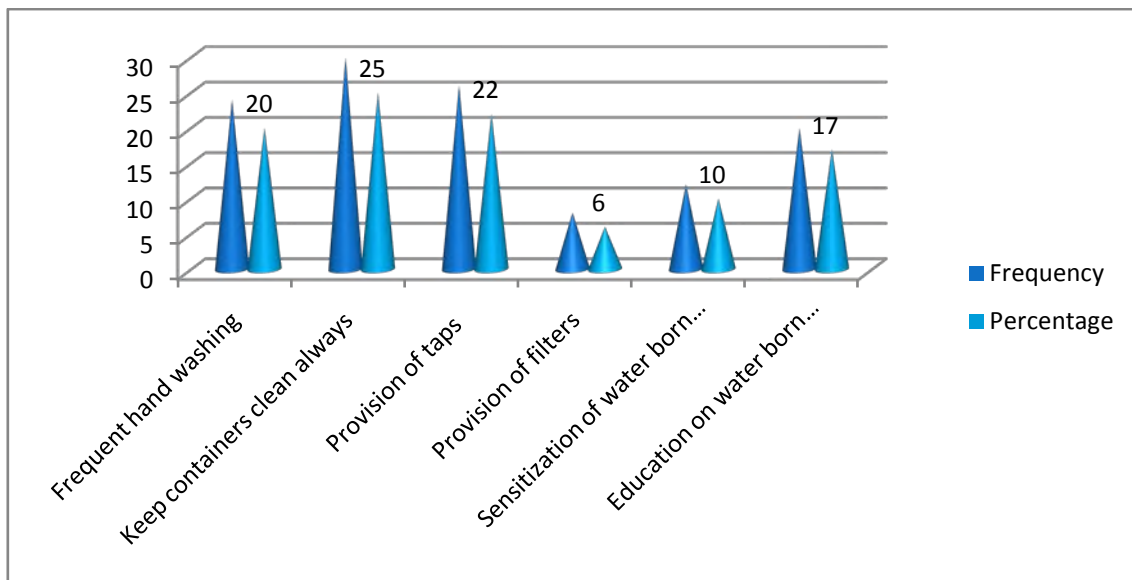


Figure 13: Proposals on how to resolve constraints encountered in the prevention of waterborne diseases

From the figure, 20% proposed frequent hand-washing, 25% proposed keeping containers always clean, 22% proposed the construction of pipe-borne stand-pipes, 17% proposed health educational lectures on waterborne diseases while 6% wished filters be provided in homes.

IV. DISCUSSION OF FINDINGS

a) Respondents' level of education

Out of the 120 respondents, 44(53%) of them had attended basic education, 40(33%) went to secondary school and 36(14%) went to the university. From this information, one can therefore deduce that knowledge deficit is really a serious problem faced by the community in the prevention of water borne diseases. This is due to the fact that, the majority of the population with only basic education cannot really understand what water borne diseases are as well as measures geared at preventing them.

b) Knowledge on the occurrence of waterborne diseases

It was illustrated in figure 5 that 60 out of the 120 respondents said waterborne diseases were acquired from contaminated water. From this information, it is clear that respondents are not completely ignorant about the occurrence of water borne diseases. Figure 7 illustrated the various types of water borne diseases enumerated by respondents in which-typhoid, cholera, malaria, diarrhoea and dysentery were mentioned. With respect to respondents' knowledge on the complications of water borne disease; all respondents enunciated that water borne diseases had major complications such as severe dehydration (33.3%), damage to tissue organs (26.6%), death (33.3%) and hypovolemic shock (6.6%), just like any other disease condition.

c) Knowledge on the prevention of water borne diseases

Analyzed data according to respondents' knowledge on the prevention of waterborne diseases; figure 9 shows that 60(50%) make efforts to treat water before drinking, 40(33%) said they practiced regular hand washing and 20(17%) believed that eating clean food and drinking clean water is the best method in preventing water borne diseases. From this information, it can be deduced that respondents are not knowledgeable enough on the practical measures towards the prevention of water born diseases, which go in line with what Gerba et al, (2010) intimated that literacy level influences hygiene and sanitation practices in our communities.

On respondents' knowledge on the sources of portable water, 52(43%) fetched drinking water from springs, 28(23%) fetched theirs from rivers, 24(21%) consumed tap water and 16(13%) drank well water. It can therefore be concluded from this information that the high prevalence of water borne diseases resulted mainly from the water consumed in the community.

Based on respondents' knowledge on water purification measures as illustrated in figure 11, 40(33%) did not purify their water, 30(25%) purified after boiling, 20(17%) used chemicals to purify water and 18(15%) practiced sedimentation. From this information, it can be concluded that, the majority of people affected by water borne disease are those who do not treat their water, especially as nobody use chlorination for water purification.

d) *Difficulties in the prevention of water borne diseases*

With the constraints faced in the prevention of water borne diseases by respondents as illustrated in figure 12, lack of health education 36 (30%), lack of finances 36 (30%), 30(25%) said they lacked time with 18(15%) emphasising on the absence of water projects to construct pipe-borne water stand-pipes in the community . This is in line with Strausbaugh's (1997) assertion that community participation and appropriate technology in handling community oriented projects ensures sustainability and their complete embrace of the project as having a baseline origin.

e) *Opinions on how to resolve the encountered difficulties*

The difficulties in preventing water borne diseases could be resolved through regular sensitization (10%), health education on water borne diseases (17%), regular hand washing (20%), keeping of water container clean (25%) and creating time for water preservation (6%). This ties with Sam Malone (2014) who indicated that it is very vital to change or ensure proper hygiene in order to avoid water borne diseases.

V. CONCLUSION

This research was geared at assessing the know-ledge and practices of households of Bamendankwe village on their knowledge in the practice of the prevention of water-borne diseases; and identify the constraints encountered in the prevention of the occurrence of water-borne diseases.

From this study, it was found out that; respondents are not well educated on the proper treatment of water from doubtful sources as well as its protection and preservation for onwards consumption; 43% of respondents do not treat water collected from streams or springs which is the main reason for the pledge for health education campaigns to be organized in communities for the prevention against waterborne diseases.

From the data collected, and analysis made it be can be concluded that there exist knowledge deficit on the causes of water-borne diseases as well as the practical measures employed in the prevention of their occurrence as evidenced by the diverse responses gotten from them. Their understanding of the notions of hygiene and sanitation, the knowledge and practices on the prevention of water-borne diseases were not based on the level of education but on how much information they got via public health education concerning the causes and preventive measures of water-borne diseases. So, an up-to-date knowledge and practices on the prevention of the occurrence of water-borne diseases through corporate approach by stakeholders is necessary for the wellbeing of the Bamendankwe community. The Bamenda-1 Council's hygiene and sanitation officers should take it a responsibility to

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- To the point depiction of the research
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Approach:

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Approach:

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Approach:

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