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FACULTY OF HEALTH AND ALLIED SCIENCE
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AWARENESS AND KNOWLEDGE ON TORCH INFECTIONS AMONG WOMEN ATTENDING ANTENATAL CLINICS IN SOME SELECTED HEALTH FACILITIES IN THE NEW JUABENG MUNICIPALITY, A PROSPECTIVE STUDY.

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NOVEMBER, 2023

CERTIFICATION

I confirm that the work reported in this thesis was carried out by the candidates under my supervision as a university supervisor**.**

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I have consented and approved of this Thesis as the Head of Department of Medical Laboratory Science.

Signed……Date……

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Department of Medical Laboratory Science.

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DEDICATION

We commit this Thesis to the Lord Almighty and our Supporting supervisor who encouraged us to embark on the project. We as team members dedicate this to ourselves for the co-operation and teamwork.

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ABSTRACT

TORCH is a group of causative agents which causes congenital and prenatal infection, namely *Toxoplasma gondii*, Rubella virus, Cytomegalovirus and Herpes simplex virus. The aim of this study was to determine the awareness and knowledge on torch infections among women attending antenatal clinics in some selected health facilities in the New Juabeng Municipality. This was a prospective study that involved all pregnant women in the age group 18 - 59 years and at any gestational age that will be attending the antenatal clinicat the Koforidua Poly Clinic. A total of 150 study participants were involved in this study. The mean age was observed to be 30.16±8.36 years. Most of them were within the age category of 20 – 29 years 60(40.0%). Most had not heard about TORCH infections 101(67.3%). On how well they knew about TOCRH, majority had no idea 77(51.3%), 41(27.3%) were very well aware while 32(21.3%) had fair idea. More than half of the women said TORCH infections could be prevented 82(54.7%). Most women were not concerned about TORCH infections 64(42.7%); however, 41(27.3%) and 45(30.0%) were fairly and much concerned respectively. In this study, higher proportions of women who have formal occupation [34.62%, p-value = 0.043], adequate knowledge on TORCH infection [39.74%, p-value = <0.001], heard of TORCH infection [53.06%, p-value = <0.001], ever being treated of TORCH [64.52%, p-value = <0.001], had miscarriage [40.0%, p-value = 0.006], are aware of the importance of regular prenatal care [43.18%, pvalue = 0.002], ever discussed treatment option with a health worker [40.91%, p –value = 0.007] and received counselling/education about TORCH during pregnancy [48.8%, pvalue = <0.001] were found to be associated with positive TORCH infection status. However, all these proportions were statistically significant as p-value was lesser than 0.05.

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CHAPTER ONE 1.1 INTRODUCTION

TORCH is a group of causative agents which causes congenital and prenatal infection, namely *Toxoplasma gondii*, Rubella virus, Cytomegalovirus and Herpes simplex virus (AlHakami et al., 2020). This (TORCH) been an acronym has become one of the most concerned in neonatal and prenatal medicine (Beune et al., 2018).

There are several suggestions by some researchers on the classification of torch been too limiting and that several infectious agents must be considered in the group, namely, hepatitis B and C, HIV, syphilis, Chagas disease, Zika virus, varicella, and parvovirus B19(Kucerova & Cervinkova, 2016)

HIV / AIDS patients, individuals who are undergoing chemotherapy, transplant recipient, pregnant women, neonates are patients and individuals possible to have this infection (Kucerova & Cervinkova, 2016). It can also pass through pregnant woman's blood stream to infect her unborn child (Mulder et al., 2002).

The importance of these screening tests has significantly increased in prenatal care today (Mulder et al., 2002). TORCH screening during pregnancy helps to investigate the of risk of having and or detection of anomaly among fetuses (Eyeberu et al., 2022).

TORCH infections may cause intrauterine infections occurring in a similar clinical presentation in the fetus in case of infection during pregnancy(Schwartz & Graham, 2020).

There are different views on the necessity of TORCH screening during pregnancy(Megli & Coyne, 2022). Investigation of torch must be immediately when pregnancy is detected, and the patient should be informed on this subject(Bates & Brantsaeter, 2016).

TORCH infections present clinical outcomes which include low birthweight, preterm birth, stillbirth, hearing and vision loss, and neurological and developmental sequalae that may have lifelong impacts on affected children. Microcephaly, hydrocephalus, developmental anomalies and delays are other hallmarks of many TORCH pathogens(Alsamarai & Aljumaili, 2013).

The risk of infection and vertical transmission varies by pathogen and by world region(Simonsen et al., 1999). Typically, neonatal outcomes are more severe when these

infections are acquired in the early stages of pregnancy, early in fetal development(Schwartz & Graham, 2020). Early detection and treatment (when available) are essential for preventing potential lifelong morbidity as well as maternal and neonatal mortality(Carroli et al., 2001).

TORCH infections disproportionately affect low-and middle-income countries, and limited resource capacity for surveillance leaves the true burden of these infections unknown(Hotez, 2021). Therefore, the aim of this study is to determine the prevalence of toxoplasmosis, rubella, cytomegalovirus, and herpes (TORCH) infections and knowledge regarding its prevention among antenatal women at the Eastern regional, St. Joseph's Hospital and SDA Hospital, a prospective study.

1.2 PROBLEM STATEMENT

There have been varied reports on the prevalence of toxoplasmosis, rubella, cytomegalovirus, and herpes (torch) among pregnant women in Ghana(Alsamarai & Aljumaili, 2013). The prevalence of toxoplasmosis rate is reported to be 83.6% and 92.5% among pregnant women in Kumasi and Accra respectively(Agordzo et al., 2020). The prevalence of rubella has been reported to be 92.6% among 405 pregnant women in Ghana(Lawn et al., 2000).

A total of 23,467 pregnant women used in a study, the overall pooled prevalence of cytomegalovirus G and rubella G infections were 7.8% and 77% respectively(Eyeberu et al., 2022).

The other study conducted in Ghana among 91 pregnant women also reported a prevalence of 68%(Amugsi et al., 2017). However, these figures seem relatively high and has brought the need to constantly maintain surveillance and sustain measures that will lead to further reduction or possible elimination of these infectious agent particularly the at-risk population.

One way preventing the infections caused by torch pathogens is via extensive screening and possible treatment (when available)(Abu-Madi et al., 2010). However, the challenges of poor screening continues to perpetuate in most developing countries partly due to logistics constrain and insufficient resource persons in the field of serology medicine(Walana et al., 2014).

The thorough screening of pregnant women therefore indispensably remains a critical medical process(Arshad et al., 2016).

The process undoubtedly does not only ensure a healthy and a safe delivery but also serves as an important platform for assessing the epidemiology of TORCH pathogens in a particular locality, especially among the pregnant women(Alsamarai & Aljumaili, 2013).

1.3 JUSTIFICATION OF THE STUDY

The findings from this study would inform policy makers such as the Ministry of Health (MOH) and allied health professionals generally, as an important test that can guide the design and implementation in blood transfusion.

The findings would serve as a basis for the management of all health facilities to recognize the need for screening for torch infection during pregnancy.

1.4 RESEACRH QUESTIONS

The study seeks to find answers to these questions

1. What is the sero-prevalence of infections among women attending antenatal clinic
2. What is the level of knowledge they women have about TORCH infections?

1.5 GENERAL OBJECTIVE OF THE STUDY

The general objective of this study is to assess the prevalence of TORCH infections among pregnant women.

1.6 SPECIFIC OBJECTIVES

1. To determine the prevalence of torch infection among pregnant women.
2. To assess the level of knowledge regarding prevention of torch infection during pregnancy.
3. To determine behavioral and socio-demographic factors associated with torch infections among pregnant women.

CHAPTER TWO 2.0 LITERATURE REVIEW

In this chapter, relevant articles relating to this study has been discussed and provides the details of the various related studies. In this study the researcher obtained and reviewed the prevalence of TORCH infections among pregnant women, using web sources including GOOGLE, GOOGLE SCHOLAR, WEB MED, and PUB MED. Some phrases used in our research included: "thesis, To determine the sero-prevalence of TORCH infections among women attending antenatal clinic. To access the level of knowledge the women have about TORCH infections?

2.1 PREGNANCY

Pregnancy is the state of fertilization and development for one or more offspring within a woman's uterus. The prenatal offspring (also called the conceptus) is referred to as an embryo or fetus(Whitley et al., n.d.).

The term embryo is used primarily for developing humans up to eight weeks after fertilization (to the 10th week of gestation). After that, the term fetus is used(Nelissen et al., 2013).

In many societies' medical or legal definitions, human pregnancy is somewhat arbitrarily divided into three trimester periods as a means to simplify reference to the different stages of prenatal development(Agoreyo & Onwegbu, 2015).

The first trimester carries the highest risk of miscarriage (natural death of embryo or fetus). During the second trimester, the development of the fetus is more easily monitored. The beginning of the third trimester often approximates the point of viability, or the ability of the fetus to survive, with or without medical help, outside of the uterus(Wiltbank et al., 2016).

2.2 EPIDERMIOLOGY OF TORCH INFECTIONS

The overall TORCH infection (IgM positivity) positivity rate was 61.1% (88/144). Rubella was the most prevalent infection (46.5%) followed by herpes simplex virus (HSV) 1 and 2 (41%) and cytomegalovirus (CMV) (34.7%)(Bitner, 1956).

The highest IgG sero-positivity was recorded against CMV (88.6%), followed by Rubella (86.8%), HSV 1 and 2 (28.4%), and toxoplasmosis (15.2%)(Manjunathachar et al., 2020).

Follow-up of IgM TORCH positive pregnant women revealed that majority of the neonates/infants are having congenital cardiac abnormalities (39.2%), followed by microcephaly/hydrocephaly (25%), low birth weight (10.7%), and deafness (3.6%). Thirtytwo percent of neonatal mortality was associated to multiple TORCH infections(Singh et al., 2015).

2.3 TOXOPLASMOSIS INFECTIONS DURING PREGNANCY AND PATHOBIOLOGY.

Toxoplasma gondii (T. gondii) causes the disease toxoplasmosis(Howe et al., 1997). Toxoplasma is a widespread parasite and, as a result, many risk factors for infection have been identified including working with meat, eating raw or undercooked meat, having contact with cat feces, and drinking unfiltered water or unpasteurized goat milk(Sibley, 2003). Similarly, other sources of exposure are lakes, reservoirs, and contaminated soil(Houel et al., 2006).

There are many ways by which Infections can occur, this includes mother-to-fetus transmission through the placenta, via an organ transplantation from an infected donor, through a blood transfusion, or through a laboratory accident(Louten, 2023).

If this infection is acquired during pregnancy, it could result in congenital toxoplasmosis(Desmonts, n.d.). Clinical manifestations of infection can also be seen later in infancy, childhood, or adolescence(Álvarez et al., 2021).

The risk of transmission solely depends on the gestational age at which the infection occurred. The transmission risk increases with increasing gestational age; however, the disease severity decreases as the gestational age increases(Palmeira et al., 2012). Additionally, other factors, such as immune factors, the virulence of T. gondii strains, and differences in genotypes, may also affect disease severity(Gibson et al., 2011).

Although this infection is typically transferred from a mother to her fetus if acquired during pregnancy, a chronically infected mother can transfer this infection to her fetus if her infection is reactivated during her pregnancy(Carlier et al., 2012).

A prior infection can be reactivated if the mother is severely immunocompromised. Researchers has added that, a previously immunocompetent mother can become immunocompromised if treated with glucocorticoids for an underlying disease(Palmeira et al., 2012).

In individuals who are immunocompromised or immunosuppressed, bradyzoites can be released from cysts and converted back to tachyzoites, which causes the reactivation of toxoplasmosis and, as a result, can present in the fetus as encephalitis or chorioretinitis (Farhat et al., 2020).

2.3 REBELLA VIRUS INFECTIONS DURING PREGNANCY

Rubella virus is a single-stranded RNA virus that belongs to the Togaviridae family(Babaeimarzangou et al., 2022). It has been known to cause a mild measles-like illness (hence the original name German measles) since the 19th century, and was not seen as a cause of significant disease(Brüssow & Brüssow, 2021).

An Australian ophthalmologist in 1941 reported that, rubella infection early in pregnancy was associated with congenital cataracts and other abnormalities in the infants, and this was called congenital rubella syndrome (CRS)(Picaud, 2001).

Rubella occurs worldwide, with a seasonal distribution (Amélia Nkutxi & Maria, 2020). Rubella is transmitted mainly by direct contact with individuals infected by droplets of nasopharyngeal secretions. The upper respiratory tract and nasopharyngeal lymphoid tissue appear to be the first sites of virus replication, and the virus then spreads to regional lymph nodes. Indirect transmission, through contact with objects contaminated with nasopharyngeal secretions, blood and urine is uncommon(Lee & Bowden, 2000).

Rubella is also transmitted via the transplacental route from the mother to the fetus. (Organizations, 2008).

The main concern represented by rubella is its teratogenicity, with maternal infection in early pregnancy leading to congenital rubella syndrome (CRS) in children(Thomas & Oma, 2011).

The effects of rubella virus on the fetus depends largely on the time of infection. General, fetal illness and manifestations are more severe during the first few weeks of gestation as this is the main period of organogenesis(Jamkhande et al., 2014).

Transplacental transmission of rubella virus during the first few weeks of gestation can result in miscarriage or stillbirth. Whether maternal infection is primary or secondary (reinfection) also influences the overall risk to the fetus(Saito et al., 2020).

In contrast to primary infection, the risk of fetal infection is less than 10% during the first 16 weeks of gestation following a secondary infection(Lazzarotto et al., 2011).

Rubella is characterized by a diffuse maculopapular and punctiform rash, which begins on the face, scalp and neck, and subsequently spreads to the entire body. Low fever and the presence of retro auricular, cervical and occipital lymphadenopathy, which usually precede the rash (5 to 10 days) are signs that contribute to the differential diagnosis in relation to other rash diseases(Tesini, 2021).

Ocular defects as a result of CRS include cataracts, microphthalmia and retinopathy. Reported cardiovascular defects include patent ductus arteriosus, ventricular septal defects and pulmonary artery hypoplasia. Intellectual impairment, behavioural disorders, and language and other developmental delays are the most common CNS defects reported(Toizumi et al., 2019).

Thrombocytopaenia purpura, low birth weight, haemolytic anaemia, hepatosplenomegaly and a large anterior fontanelle are all transient manifestations. (Jolowicz, 1988). The effects of rubella infection in pregnancy are unpredictable, ranging from normal birth, spontaneous abortion, death shortly after birth or even birth with simple or combined abnormalities, such as damage to the central nervous system, leading to delayed physical growth and mental, microcephaly, encephalitis, hepatomegaly, cardiac malformations, pneumonia, eye and hearing defects(Chan et al., 2016).

2.4 CYTOMEGALOVIRUS (CMV) INFECTIONS DURING PREGNANCY

Cytomegalovirus (CMV) infection is the most frequent congenital infection worldwide and is diverse in its clinical manifestations. The fetus can be infected by two ways, either a newly acquired (primary) maternal infection or a recurrent (reactivated) maternal infection(Kaslow et al., 2014).

Congenital CMV infection results from transplacental transmission of the virus during maternal viremia. Maternal viremia is more likely to occur with primary than with recurrent infection(Bialas et al., 2015).

After transplacental transmission, the virus spreads through the fetus by a hematogenous route(Yamamoto et al., 2011).

The likelihood of fetal infection and the risk of associated damage and sequelae is higher after a primary infection. Although most congenitally infected infants are asymptomatic at

birth, congenital CMV infection is a leading cause of sensorineural hearing loss, mental retardation, and neurologic deficits(Dumanch et al., 2017).

Infection at an earlier gestational age often correlates with a less favorable outcome(Megli & Coyne, 2022).

The presence of maternal antibody to CMV before conception provides substantial protection against intrauterine transmission of the virus and severe fetal infections(Britt, 2015).

The protection, however, is incomplete, and congenital CMV infection may follow recurrent maternal infection. More recent studies suggest symptomatic congenital CMV infection after a recurrent maternal infection occurs more frequently than previously documented(Demmler-Harrison & Miller, 2020).

Although CMV affects most cell types, it has a special affinity for epithelial cells, ependymal cells lining the ventricles, the organ of Corti, and the neurons of the eighth cranial nerve.The characteristic pathologic features include cytomegaly, intranuclear inclusions ("owl's eye" appearance), intracytoplasmic inclusions, and multinucleated giant cells(Fatema et al., 2014).

About 90% of congenitally infected infants are asymptomatic at birth. Jaundice (62%), petechiae (58%), and hepatosplenomegaly (50%) are the most frequently noted classical triad(Moncada & Montoya, 2012).

Other clinical manifestations include oligohydramnios, polyhydramnios, prematurity, intrauterine growth retardation, nonimmune hydrops, fetal ascites, hypotonia, poor feeding, lethargy, thermal instability, cerebral ventriculomegaly, microcephaly, intracranial calcifications usually periventricular in distribution, "blueberry muffin" spots, and chorioretinitis(Orlikowsky, 2018).

Sensorineural hearing loss develops in 30% of symptomatic infants at birth. Infants with symptomatic CMV infection may be at increased risk for congenital malformations such as inguinal hernia in males, high-arched palate, defective enamelization of the deciduous teeth, hydrocephalus, clasp thumb deformity, and clubfoot. Some affected infants may develop hepatitis, pneumonia, osteitis, and intracranial hemorrhage(Yamamoto et al., 2011).

2.5 HERPES SIMPLEX INFECTIONS DURING PREGNANCY

Herpes Simplex is a viral disease that can lead to painful sores on the lips and mouth (oral herpes) and anogenital area (generally referred to as herpes)(Usatine & Tinitigan, 2010).

Transmission of the infection is usually through close contact with a person who is shedding the virus that individual may or may not have an active lesion typically at a mucosal surface or in genital or oral secretions. Infection occurs if the virus is in contact with susceptible surfaces such as the oropharynx, cervix, conjunctiva or through small cracks (perhaps even microscopic) in the skin(Mustafa et al., 2016).

Kissing and sexual activity are very common forms of transmission. HSV is easily inactivated at room temperature and by drying so transmission through the air or fomites is rare. Certain occupations that have increased likelihood of contact with oral secretions (dentists, respiratory care unit personnel, etc.) have increased risk of infection on other skin areas(Terrault et al., 2013).

Transmission of HSV can occur in infants born to mothers who are shedding the virus at delivery. Keeping the immune system healthy may impact likelihood of infection and reactivation.(Kimberlin et al., 2013).

A rare complication is widely disseminated HSV infection in the mother during pregnancy leading to a serious illness with a mortality of more than 50%.

Transplacental infection may lead to spontaneous abortion before 20 weeks. Most commonly, however, the infected mother has localized disease affecting the genitals. HSV may lead to spontaneous abortion. Congenital anomalies have been related to HSV infection but only 70 cases have been reported worldwide(Conde-Ferráez et al., 2013). Prematurity and related complications have also been reported, of neonates who are infected and delivered close to term: 35% have skin, eye, and mouth (SEM)infection, 33% have CNS involvement with or without SEM infection and have an intermediate prognosis (15% mortality), 32% have disseminated infection with 60% mortality(Shapiro-Mendoza & Lackritz, 2012).

METHODOLOGY 3.0 INTRODUCTION

This chapter presents the various procedure and methods for achieving the objectives of the study. It encompasses the setting of the study, study design, population of the study,

inclusion criteria, exclusion criteria, sample size, data collection procedure, data analysis, ethical considerations regarding the study.

3.1 STUDY DESIGN

This will be a prospective cross-sectional study which will be used to gather data on toxoplasmosis, rubella virus, cytomegalovirus and herpes simplex infections among women attending antenatal clinics at the Eastern regional Hospital, Koforidua Poly Clinic and the S.D.A Hospital.

3.2 STUDY SETTING

The research will be conducted at the Eastern regional Hospital, Koforidua Poly Clinic and the S.D.A Hospital.

3.3 STUDY POPULATION

The study will involve healthy pregnant women between the ages of eighteen (18) to fortynine (49) who the Eastern regional Hospital, Koforidua Poly Clinic and the S.D.A Hospital.

3.4 INCLUSION CRITERIA

All pregnant women in the age group 18 - 49 years and at any gestational age are eligible participants.

3.5 EXCLUSION CRITERIA

Pregnant women who are anemic or not willing to participate in the study.

3.6 BLOOD SAMPLING

Three (3) milliliters of Venous blood sample will be drawn from each the study participants. Their safety will be ensured by following protocols with regards to sample taking and only trained professionals will take blood samples

2.7 SAMPLE SIZE DETERMINATION

The total sample size selected for this study is based on the statistical formula by Glenn (Glenn.D, 2012)

$$N = \frac{N}{1+N(e)^2}$$

Where; n is the sample size, N is the population size, e is margin of error at 5 % (standard value of 0.05)

From the statistical formula stated above, the ideal sample size will be determined for the study.

N= representing a population of antenatal women at the Eastern regional Hospital, Koforidua Poly Clinic and the S.D.A Hospital.

$$N = \frac{227}{1+227(0.05)^2}$$ so N=150

Sample size for the study is 150 participants.

3.8 DATA COLLECTION INSTRUMENTS.

This study considered only primary source of data and the data will be collected by us.

3.9 DATA ANALYSIS

When the data was collected, it wasorganized, coded and entered using Excel and then it was be exported to Stata version 15 for analysis. The data analysis employs descriptive and inferential statistics. The descriptive statistics includes frequency counts, percentages, and other parameters to answer the research questions. The data would be analyzed and presented in tables and diagrams. The graphical technique that would be used in the study is charts and tables. The summary of the data consists of percentages, cross tabulations, frequencies and charts.

The analysis will be used to ascertain whether or not significant differences exist among the different groups of data collected. The study will be done at 0.05 level of significance.

3.10 ETHICAL CONSIDEREATION

Informed consent was sought from all the participants. Also due to the Covid 19 pandemic, there would be strict adherence to the safety protocols spelt by the GHS. Therefore, we would wear our mask each time to the hospital and ensure our research participants do same by offering them disposable mask if they are not in one. We would as well use sanitizer before and after handling any stationary. Ethical clearance will be sought from the Ethical Review committee of Koforidua Technical university.

The purpose of the research will be explained in detail to the study participants, they would be allowed to make a decision on whether or not to participate in the study. This will ensure autonomy. The study participants who agree to participate will give a verbal consent. The data obtained will be treated privately with no name tag on it. The study participants will be treated with respect and their rights to privacy and confidentiality would be observed.

3.12 EXPECTED OUTCOME

We expect to know the prevalence of TORCH infections among women attending antenatal clinics as well as their knowledge about these infections". And this would inform the public health the need to educate the general populace most especially pregnant women on TORCH infection and its preventions.

CHAPTER FOUR 4.0 RESULTS AND INTREPRETATION

A total of 150 study participants were involved in this study. The mean age was observed to be 30.16±8.36 years. Most of them were within the age category of 20 – 29 years 60(40.0%). About a third of the participants, representing the majority had tertiary level

education 49(32.7%) while 26(17.3%) representing the least number were Junior High School levels. Most of the study subjects were formally employed 52 (34.7%) and earning between GHC 1000 – 2990 103 (68.7%) [Table 1].

TABLE 1: DEMOGRAPHIC CHARACTERISTICS OF STUDY PARTICIPANTS

Variables	Frequencies	Percentages
Age (years)	30.16±8.36	
Age Category (years)		
<20	14	9.3
20 - 29	60	40.0
30 - 39	56	37.3
40 - 49	13	8.7
50 - 59	7	4.7
Educational Level		
No Education	32	21.3
JHS	26	17.3
SHS	43	28.7
Tertiary	49	32.7
Occupation		
Unemployed	13	8.7
Student	16	10.7
Informal	69	46
Formal	52	34.7
Income Level		
1000 - 2990	103	68.7
3000 - 5990	37	24.7
6000 - 8990	5	3.3

9000 - 11990	5	3.3

Generally, majority of the pregnant women had adequate knowledge on TORCH infection as shown in Figure 1.

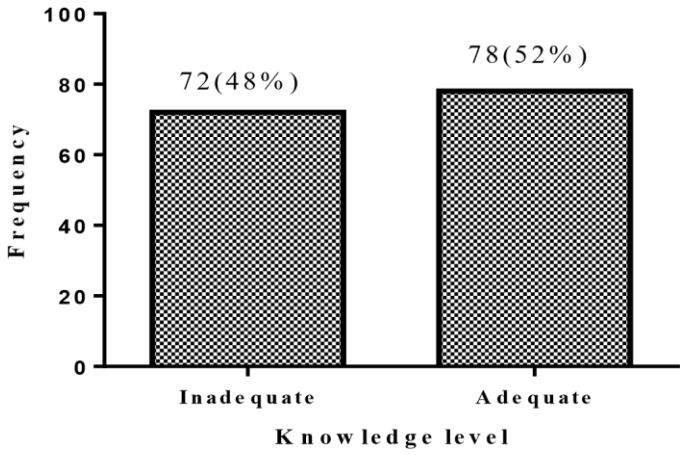

Figure 1: Level of knowledge and health seeking behavior of study participants on TORCH infections

Table 2 shows the detailed response used to evaluate the level of knowledge. Specifically, most had not heard about TORCH infections 101(67.3%). On how well they knew about TOCRH, majority had no idea 77(51.3%), 41(27.3%) were very well aware while 32(21.3%) had fair idea. More than half of the women said TORCH infections could be prevented 82(54.7%). Most women were not concerned about TORCH infections 64(42.7%); however 41(27.3%) and 45(30.0%) were fairly and much concerned respectively. One hundred and nine representing the majority will seek medical care if infected with TORCH infections 109(72.7%) and 113(75.3%) will follow recommendations about TORCH infections. Stillbirth, mental retardation, cataracts, hearing impairment, pneumonia, cardiac malfunction, jaundice, hepatosplenomegaly, encephalitis and growth retardation were considered consequences of TORCH infections by 98(65.3%), 30(20.0%), 21(14%), 14(9.3%), 51(34.0%), 35(23.3%), 32(21.3%), 5(3.3%), 12(8.0%) and 14(9.3%) of the pregnant women respectively.

Table 2: Knowledge and attitude of study participants on TORCH infections

Variables	Frequency	Percentage(%)
Heard about TORCH infections No		
	101	67.3
Yes	49	32.7
How well you know about TORCH infections No idea		
	77	51.3
Fair idea	32	21.3
Very well	41	27.3
TORCH infections can be prevented No		
	68	45.3
Yes	82	54.7
How concerned are you about TORCH infections No concern	64	42.7
Fairly concerned	41	27.3
Much concerned	45	30
Likely to seek medical care if infected with TORCH		
No	41	27.3
Yes	109	72.7
Willing to follow healthcare worker's recommendatio ns about TORCH		
No	37	24.7
Yes	113	75.3
Consequences		
Stillbirth	98	65.3
Mental retardation	30	20
Cataracts	21	14
Hearing impairment	14	9.3
Pneumonia	51	34
Cardiac malfunction	35	23.3
Jaundice	32	21.3
Hepatosplenomegaly	5	3.3
Encephalitis	12	8
Growth retardation	14	9.3

Data are presented as figure and percentages

The study also observed that only 39(26%) of the participants to be positive for any or all of the TORCH infections (Figure 2).

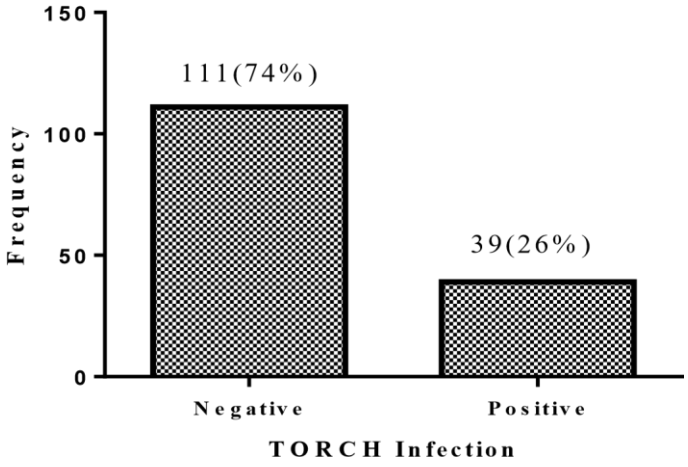

Figure 2: Prevalence of TORCH infections among study participants

Specifically, 27(18.0%), 20(13.3%), 17(11.3%) and 16(10.7%) had toxoplasmosis, rubella, cytomegalovirus and herpes simplex virus infections respectively (Figure 3).

FIgure 3: Self-reported prevalence of the various TORCH infection among study participants

At the time of the study, minority of the pregnant women had not been pregnant before

29(19.3%). Most of the participants have not had a miscarriage 100(66.7%), not tested for TORCH during pregnancy 119(79.3%), not vaccinated against rubella 120(80.0%) and had not come into contact with someone with TORCH infection during pregnancy 121(80.7%). Some of the symptoms identified by the pregnant women for TORCH included fever 112(74.7%), rash 38(25.3%) and fatigue 29(19.3%). The minority of the participants responded in the affirmative to ever having ultrasound and other imaging to evaluate TORCH infection 34(22.7%). Only 62(41.3%) ever had been advised to take TORCH preventive measures and 62(41.3%) had been informed of potential risk and complications of TORCH infections. About a third, had ever discussed treatment options 44(29.3%), aware of the importance of regular prenatal care 44(29.3%) and ever received counselling/education about TORCH during prenatal care 43(28.7%).

Table 3: Pregnancy and TORCH infection assessment

			Percentage(%)
Variables	**Frequency**		
No of pregnancies			
0	29		19.3
1	49	32.7	
2	31	20.7	
3	22	14.7	
4	9	6	
5	6	4	
6	4	2.7	
Ever had a miscarriage or still birth			
No	100		66.7
Yes	50		33.3
Ever tested for TORCH during pregnancy			
No			

			119	79.3
Yes	31	20.7	**Ever been vaccinated against Rubella**	
No				
			120	80
Yes			30	20
Ever come into contact with someone with TORCH during pregnancy				
No			121	80.7
Yes			29	19.3
Symptoms of TORCH				
Fever			112	74.7
Rash			38	25.3
Fatigue			29	19.3
Ever had Ultrasound and other imaging to evaluate TORCH during pregnancy				
No			116	77.3
Yes			34	22.7
Ever been advised to take TORCH infection preventive measures				
No			88	58.7
Yes			62	41.3
Informed on potential risk and complications of TORCH				
No			99	66
Yes			51	34
Ever discussed treatment options of TORCH with health worker				
No			106	70.7
Yes			44	29.3
Aware of the importance of regular prenatal care and monitoring for TORCH infections				
No			106	70.7
Yes			44	29.3
Ever received counselling/education about TORCH during prenatal care				
No			107	71.3
Yes			43	28.7

In this study, higher proportions of women who have formal occupation [34.62%, p-value = 0.043], adequate knowledge on TORCH infection [39.74%, p-value = <0.001], heard of TORCH infection [53.06%, p-value = <0.001], ever being treated of TORCH [64.52%, pvalue = <0.001], had miscarriage [40.0%, p-value = 0.006], are aware of the importance of regular prenatal care [43.18%, p-value = 0.002], ever discussed treatment option with a health worker [40.91%, p –value = 0.007] and received counselling/education about TORCH during pregnancy [48.8%, p-value = <0.001] were found to be associated with positive TORCH infection status.

Table 4: Association between demographic and behavioral characteristics with TORCH infection

Variables	Negative	Positive	p-value
Age Category (years)			0.095
<20	13(92.86)	1(7.14)	
20 - 29	49(81.67)	11(18.33)	
30 - 39	35(62.50)	21(37.50)	
40 - 49	9(69.23)	4(30.77)	
50 - 59	5(71.43)	2(28.57)	
Educational Level			0.076
No Education	26(81.25)	6(18.75)	
JHS	20(76.92)	6(23.08)	
SHS	35(81.40)	8(18.60)	
Tertiary	30(61.22)	19(38.78)	
Occupation			**0.043**
Unemployed	13(100.00)	0(0.00)	
Student	14(87.50)	2(12.50)	
Informal	50(72.46)	19(27.54)	
Formal	34(65.38)	18(34.62)	
Income level			0.287

1000 - 2990	81(78.64)	22(21.36)	
3000 - 5990	24(64.86)	13(35.14)	
6000 - 8990	3(60.00)	2(40.00)	
9000 - 11990	3(60.00)	2(40.00)	
Knowledge level on TORCH infections			**<0.001**
Inadequate	64(88.89)	8(11.11)	
Adequate	47(60.26)	31(39.74)	
Heard about TORCH infections			**<0.001**
No	88(87.13)	13(12.87)	
Yes	23(46.94)	26(53.06)	
Ever tested for TORCH during pregnancy			**<0.001**
No	100(84.03)	19(15.97)	
Yes	11(35.48)	20(64.52)	
Ever had a miscarriage or still birth			**0.006**
No	81(81.00)	19(19.00)	
Yes	30(60.00)	20(40.00)	
Aware of the importance of regular prenatal care and monitoring for TORCH infections			**0.002**
No	86(81.13)	20(18.87)	
Yes	25(56.82)	19(43.18)	
Ever discussed treatment options of TORCH with health worker			**0.007**
No	85(80.19)	21(19.81)	
Yes	26(59.09)	18(40.91)	
Ever received counselling/education about TORCH during prenatal care			**<0.001**
No	89(83.2)	18(16.8)	
Yes	22(51.2)	21(48.8)	

Number of pregnancies ever had			0.468
Never pregnant	23(79.31)	6(20.69)	
Ever pregnant	88(72.73)	33(27.27)	

After adjusting for all other factors, occupation, having heard of TORCH infection, ever being treated of TORCH and receiving counselling/education about TORCH during pregnancy were found to be independently associated with positive TORCH infection status. Compared to those who were unemployed, those who were informally employed had 8.79 folds increased odds of infection [aOR = 8.79, 95%CI: 1.44 – 53.80; p-value = 0.019]. Those who have ever heard of TORCH were at 5.56 increased odds of infection compared to those who had not [aOR = 5.56, 95% CI: 1.90 – 16.26; p-value = 0.002].]. Those who have ever tested for TORCH during pregnancy were at 6.03 increased odds of infection compared to those who have not [aOR = 6.03, 95% CI: 1.72 – 21.12; p-value = 0.005].]. Those who have ever received counselling/education about TORCH infection during prenatal care were at 4.72 increased odds of infection compared to those who have not [aOR = 4.76, 95% CI: 1.46 – 15.48; p-value = 0.010].

Table 5: Association strength between demographic and behavioral characteristics with torch infection

	cOR	**95%CI**	**p-value**	**aOR**	**95%CI**	**p-value**
Variables Occupation						
Unemployed	Ref			Ref		
Informal	5.13	1.11-23.70	**0.036**	8.79	1.44 - 53.80	**0.019**
Formal	7.15	1.52 - 33.53	**0.013**	3.98	0.65 - 24.19	0.134
Knowledge level on TORCH infec tions						
Inadequate	Ref			Ref		
Adequate	5.28	2.22 - 12.51	**<0.001**	1.87	0.60 - 5.85	0.284

Heard about TORCH						
No	Ref			Ref		
Yes	7.65	3.41 - 17.18	**<0.001**	5.56	1.90 - 16.26	**0.002**
Ever tested for TORCH during pregnancy						
No	Ref			Ref		
Yes	9.67	3.95 - 23.17	**<0.001**	6.03	1.72 - 21.12	**0.005**
Ever had a miscarriage or stillbirth						
No	Ref			Ref		
Yes	2.84	1.34 - 6.05	**0.007**	1.42	0.44 - 4.55	0.553
Aware of the importance of regular prenatal care and monitoring for TORCH infections						
No	Ref			Ref		
Yes	3.27	1.51 - 7.06	**0.003**	1.36	0.44 - 4.21	0.588
Ever discussed treatment options of TORCH with health worker						
No	Ref			Ref		
Yes	2.8	1.30 - 6.04	**0.009**	0.73	0.24 - 2.22	0.579
Ever received counselling/education about TORCH during prenatal care						
No	Ref			Ref		
Yes	4.72	2.16 - 10.33	**<0.001**	4.76	1.46 - 15.48	**0.010**

CHAPTER FIVE 5.0 DISCUSSION 5.1 TO DETERMINE BEHAVIORAL AND SOCIODEMOGRAPHIC FACTORS ASSOCIATED WITH TORCH INFECTIONS AMONG PREGNANT WOMEN

This study found TORCH prevalence to be highest among the age category 30 - 39 years and the least in those < 20 years. This is consistent to findings in Kumasi where it was highest in those in the age category of 31 - 35 and the least being below 25 years(Warnecke et al., 2020). This probably may be due to the pattern of sexual among the age group. Active sexual involvement begins early and gradually increases and then declines as one ages as reflective in this study (Caltabiano et al., 2020).

This however varies from the findings of other researchers where it is highest among individual less than 20 years and decreased as the age group increased (Walana *et al*., 2014).

The trend with respect to educational background had a significant difference among the group. The few individuals who had the highest indication of past infection where all in the

tertiary category (19 %) and the least in those in non-educational background category (6%). This is contrary to a study conducted in the zakho city – Iraq, where the prevalence was higher among the non-educational group (17.75%) and (0%) prevalence among the tertiary group using ELISA as a technology(Sultan et al., 2017). This is probably because of the test technology used in that study serves as a confirmatory test by giving an accurate results.

The occupations of most of the subjects with past seropositivity were individuals with formal occupations such as health worker, police officers, teachers and bankers etc. this is similar to a study conducted in Sao Paulo state, Brazil (Gonçalves et al., 2010) and it is not similar to study conducted in Komfo Anokye Techning Hospital, where traders had the highest prevalence (Addo et al., 2023). Their regular interaction and contacts with a lot of people as part of their business activities may probably be a contributing factor to why majority have already been exposed to these viruses (Lindahl et al., 2015).

They may have come into contact with some viruses through contact with contaminated body fluids such as saliva and rubella through contaminated aerosol. Again, the high levels among all the educational groups and the possible reason to be ascribed to this trend is that equally higher number of subjects regardless of their educational background have had multiple sexual partners with only few using protection (condom) during sexual intercourse as seen in other studies (Ahinkorah et al., 2021).

5.2 TO ASSESS THE LEVEL OF KNOWLEDGE REGARDING PREVENTION OF TORCH INFECTION DURING PREGNANCY.

In this study, we observed that majority of the study participant 78(52%) had adequate knowledge and 72(48%) had inadequate knowledge about TORCH infections, which is disparity to a previous finding of a pre-test percentage of level of knowledge where 27(90%) of mothers had inadequate knowledge, 1(3%) of the mothers had moderately adequate knowledge 2(7%) of the mothers had adequate knowledge (Yousuf et al., 2023).

Even though there is a similarity in the test technology, the differences in the prevalence rate might be due to some difference in educational level, geographical variation, public

awareness, preventive measures, educational programs, the population's size and the selection criterial etc.

Stillbirth, mental retardation, cataracts, hearing impairment, pneumonia, cardiac malfunction, jaundice, hepatosplenomegaly, encephalitis and growth retardation were considered consequences of TORCH infections in our study by 98(65.3%), 30(20.0%), 21(14%), 14(9.3%), 51(34.0%), 35(23.3%), 32(21.3%), 5(3.3%), 12(8.0%) and 14(9.3%) of the pregnant women respectively.

This is also similar to a study conducted at the Komfo Anokye Teaching Hospital where majority of the respondents who had ever experienced either miscarriage or stillbirth or both had antibodies to the IgG of the various TORCH infections(Acquaye et al., 2021). The researchers concluded that, the viruses may have played a role in the cause of miscarriage and or stillbirth in those pregnant women because they are known to cause miscarriage and or stillbirth (Cengiz et al., 1993). However, it cannot be said they were the cause of the miscarriage and stillbirth as seen among respondents.

More than half of the women said TORCH infections could be prevented 82(54.7%).
Most women were not concerned about TORCH infections 64(42.7%); however 41(27.3%) and 45(30.0%) were fairly and much concerned respectively. One hundred and nine representing the majority will seek medical care if infected with TORCH infections 109(72.7%) and 113(75.3%) will follow recommendations about TORCH infections.

This is similar to previous findings in a study conducted in Northern and Southern Turkey, where majority of the participant consented to seek and follow treatment and medical recommendation about TORCH infections (M Saajan et al., 2017). This may be because of the risk factors and the effect of this TORCH infection on the health both the mother and the unborn baby or neonate.

5.3 CONCLUSION

- This study revealed that, majority of the study participant had adequate knowledge regarding prevention of torch infection during pregnancy.

- Behavioral and socio-demographic factors associated with torch infections among pregnant women was found to be statistically significant.

5.4 RECOMMENDATIONS

The routine screening during pregnancy should be redesigned to capture TORCH infection screening and the register should also capture variables such as occupation, level of education and marital status, on the demographic characteristics of pregnant women. Pregnant women who tests reactive for any of the infections should be referred to the public health unit for further treatment.

The director public health should ensure that health education on toxoplasmosis, rubella, cytomegalovirus and herpex simplex is intensified (example, the use of condoms) in the Eastern Accra region particularly New Juabeng South District**.**

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AWARENESS AND KNOWLEDGE ON TORCH INFECTIONS AMONG WOMEN ATTENDING ANTENATAL CLINICS IN SOME SELECTED HEALTH FACILITIES IN THE NEW JUABENG MUNICIPALITY, A PROSPECTIVE STUDY.

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