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SCHOOL OF PUBLIC HEALTH

COLLEGE OF HEALTH SCIENCES

UNIVERSITY OF GHANA

FACTORS ASSOCIATED WITH BIRTH DEFECTS IN CHILDREN OF TEENAGE MOTHERS IN THE AGONA EAST DISTRICT OF THE CENTRAL REGION, GHANA

BY

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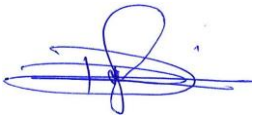
DECLARATION

With the exception of the appropriately referenced sources, I, Ahadome Nelson, do hereby declare that this project was executed by me at the Department of Health Policy Planning and Management, School of Public Health, University of Ghana, under the supervision of Dr. Paulina Tindana and this research has not already been submitted for any other degree nor for any other academic or commercial purpose.

Signature:  Date: 22/11/2021

Ahadome Nelson
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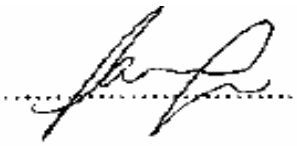
Signature:  Date: 22/11/2021

Dr. Paulina Tindana
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TABLE OF CONTENT

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University of Ghana http://ugspace.ug.edu.gh

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DEDICATION

To my dear mother Juliet, who dedicated her teenage days to taking care of me through thick and thin to ensure my survival and subsequently my success in life. Then to my whole family in Italy and Ghana including the Borello and the Kpatsa family for their support, constant care and encouragement.

Finally, to the entire student and staff body of the School of Public Health, University of Ghana especially Dr. Patricia Akweongo for her outstanding leadership and support to the HPPM department and the university as a whole.

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ACKNOWLEDGEMENT

I am deeply grateful to the almighty God for making this research a success that throws insight into the devastating issues of teenage pregnancy and the health of infants born to teenage mothers. It is my hope that this piece of work would be an eye opener to policy makers and all concerned stakeholders to take recommended actions to save precious lives and secure a more rewarding future for our younger generations. I am highly indebted to Dr. Paulina Tindana for her support, supervision and ultimate dedication to make this piece excellent. It is not possible to have successfully executed this project without a guardian like you to direct me. I wish you good health and many more success in all your endeavours.

To the teenage mothers who participated in this study, I want to say a big 'thank you' for your dedication, trust and honesty in aiding us obtain quality information to carry out this research. There are many people who may object to some of our sensitive questions but you opened up to ensure the success of this project despite the fact that there was no direct benefit or payment to you. May you become admirable heroes who would help control teenage pregnancy and its ill effects. God bless you, your children and your whole family.

To all my colleagues and leaders in the Agona Duakwa Salvation Army Hospital, Rehab Centre, and the Health Service as a whole, I want to thank you for making it possible for me to undertake this program. To all my research assistants (Richmond and Linda), translators and proof-readers, I am very grateful for your support.

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LIST OF FIGURES AND TABLES

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LIST OF ABBREVIATIONS

1. ANC:	Antenatal Clinic
2. BD:	Birth Defect,
3. CP:	Cerebral Palsy
4. CS:	Caesarean Section
5. DK:	Don't know
6. FGD:	Focus Group Discussion
7. GHS:	Ghana Health Service
8. MOH:	Ministry of Health
9. OR:	Odds Ratio
10. PHCC:	Primary Health Care Centre
11. WHO:	World Health Organization.

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DEFINITION OF TERMS

1. **Adolescent**: A youngster between 10 and 20 years of age
2. **Abortion**: termination of pregnancy
3. **Birth defect**: Inborn errors of baby's development presenting as structural or functional anomaly
4. **Teenage mother**: A teenage girl who has delivered a living child or children
5. **Teenager**: A young person between 13 to 19 years of age
6. **Unintended pregnancy**: An early or unplanned pregnancy
7. **Unsuccessful abortion**: attempted abortion which did not result in termination of pregnancy

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ABSTRACT

BACKGROUND

Teenage pregnancy and the adverse complications that come with it is a global issue of concern. Globally, over 8.14 million teenagers give birth annually with majority of these births taking place in low- and middle-income countries. In Ghana, over 75000 teenagers give births each year with Central region accounting for more than 20% (Konadu Gyesaw & Ankomah, 2013). The problems and issues of teenage pregnancy does not only affect the victims but also their families and community. It has been observed that teenage pregnancy follows a totally different pathway as compared to pregnancy in older reproductive women (Edessy et al., 2014). Also, the diverse factors associated with teenage pregnancy play a key role in exposing new-borns to infant mortality and birth defects which can lead to morbidity. Birth defects represent a considerable and increasing clinical and public health challenge because of their global impact on the health of various populations. It occurs 1 in 33 births and this is translated into over 8 million births globally every year (WHO, 2013). This study aimed to investigate the factors associated with birth defects in children of teenage mothers in the Agona East District in the Central region of Ghana.

METHODOLOGY: This study was an analytical cross-sectional study using mixed methods. The quantitative part of the study examined the risk factors teenage mothers were exposed to during their pregnancy. The qualitative part of the study of the study involved focus group discussions with teenage mothers. Five focus groups were formed comprising 4-5 teenage mothers in each group. Quantitative data were analysed using Stata version 15.0 while qualitative data were analysed thematically using manual method where recordings were transcribed and coded manually using thematic content analysis.

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Result: A total of 153 children aged 0-2 years and their teenage mothers with a mean age of 17.6 (+ 1.3SD) were selected and included in this study. The study observed a 49% prevalence of birth defect among children of teenage mothers. However, for confirmed cases by medical report, 29% prevalence was observed. Two significant factors were observed to have contributed to the birth defect prevalence. Teenage mothers who took abortion drugs (such as Cytotec, chloramphenicol, medabond etc) during pregnancy were at increased odds of giving birth to children with some defects if abortion is not successful (AOR: 4.42; 95% CI: 1.24-15.73) while children born to teenage mothers who were exposed to radiation during pregnancy, irrespective of the period the exposure occurred, were also more likley to have birth defect compared to children whose teenage mothers did not experience any form of exposure during the pregnancy (AOR: 4.34; 95% CI: 1.03-18.24). The qualitative interviews suggest that knowledge and awareness among the teenage mothers on birth defect was generally low but those affected find it very daunting and demanding to take care of the children. Teenage pregnancy experiences shared during FGDs showed high levels of stigma against teenage pregnant mothers which pushed them to attempt for abortion. A number of teenage mothers perceived lack of access to quality healthcare and poor economic situation as factors causing birth defects in babies. Some of them reported how teenage pregnancy and caring for their child with birth defect denied them the opportunity to continue their education or complete their skill training.

Conclusion:

The study identified 2 main factors (attempted abortion and exposure to radiation) were more profoundly associated with birth defect in children of teenage mothers. The study also found that

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there was low knowledge about birth defect among teenage mothers and most teenagers whose children had birth defects suffered stigma in the community. There is the need for health authorities to institute clear policies and programmes targeting adolescent girls who have children with birth defects to ensure that their health needs are adequately addressed.

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CHAPTER ONE

INTRODUCTION

1.0 Background

Birth defects are a common group of structural malformations, incomplete development and dysfunction of important tissues and organs of the human body (Christianson et al., 2008). They represent one of the major public health challenges that occurs in children. Though it could occur in children delivered by any age group, it has been observed to be more prevalent among children whose mothers have higher risk exposures **(WHO, 2010).**

According to the World Health Organization (WHO) in 2010, an estimated 270,000 neonatal deaths globally were attributable to congenital anomalies, with neural tube defects, cerebral palsy and heart defects being part of the most serious and most common of these anomalies (WHO, 2013). In 2004, Botto *et al* observed that more than 10,000 children are born with birth defects globally on daily basis. Globally, congenital malformations account for about 6% of all births but about 90% of that occurs in developing nations of which Ghana is part (Shawky & Sadik, 2011). In 2018, the Salvation Army Rehab Centre in the Agona East District recorded over 40 cases of birth defects in children of teenage mothers who came for rehabilitation from the centre. Comprehensive data on the magnitude of birth defects among teenagers is however limited in developing countries despite the WHO resolution on birth defect surveillance (WHO, 2013).

The literature suggests that teenage pregnancy is an important contributor to birth defects and developmental anomalies in unborn and new infants (Edessy et al., 2014). This is characterised by low birthweight, lower APGAR score, structural and developmental anomalies (Ash & Ogakwu, 2014). Several studies from developed countries and low income countries have reported teenage

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pregnancy as an important risk factor for preterm delivery, low birth weight and structural malformations (Chen, Wen, Fleming, Demissie, et al., 2007). There are however some studies which do not agree that maternal age could be an independent risk factor for birth defects. They believe socioeconomic limitations, poor health system, lack of family support, improper nutrition and lack of proper care are underlining factors that increase the risk of poor neonatal outcomes for teenage mothers (Chen, Wen, Fleming, Demissie, et al., 2007).

Teenage pregnancy has been a key problem all over the world and its incidence is on the rise. The incidence of the unmarried adolescent pregnancy has been evidently problematic in all of Africa and researchers are rapidly becoming interested in understanding the possible detrimental effects of this on the continent (Sunday et al., 2010). It has been observed that this trend in the rising incidence of teenage pregnancy and its complicated outcomes have serious detrimental effects on society and sustainable development in African countries (Liang & UNFPA, 2013). Teenage pregnancy has irreparable consequences and violates the rights of the teenage girl while posing as a threat to the health of the girl and her offspring (Liang & UNFPA, 2013). About 16 million girls become pregnant each year across the world but more than 40% of these pregnancies occur in Sub-Saharan Africa (Konadu Gyesaw & Ankomah, 2013). In the USA alone, about 1 million adolescent girls become pregnant each year with about 500,000 births occurring to school going girls aged 11 to 19 years (Chen, Wen, Fleming, Demissie, et al., 2007).

In Ghana, adolescent pregnancy form about 30% of all registered births in the country (UNFPA, 2018). Konadu Gyesaw & Ankomah, (2013) observed that adolescent birth rate in Ghana is about 60 per 1000 women. Arquitectura et al (2015), observed that Ghana Health Service (GHS) recorded over 75000 teenage births in 2014 alone. In the same year, the Central region of Ghana

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was also marked as having the highest prevalence of teenage pregnancy with over 14000 teenage births (Arquitectura et al., 2015). The district health directorate of the Agona East District also recorded over 300 teenage births in the Agona East District in 2018 alone.

For some girls, adolescent pregnancy is marked with pain, regret and suicidal thoughts and it actually accounts for more than 15% of the global burden of disease for maternal conditions and subsequently accounts for more than 13% of all maternal deaths (World Health Organization, 2006). Teenage pregnancy is not only unplanned but also undesired hence it is observed that more than 4 million teens opt for abortion but more than 14% of them had to resort to unsafe methods carried out by people who do not have the necessary medical expertise and done in unfitting environment (World Health Organization, 2006). The burden of unsafe abortion is higher in low income countries in Africa and Latin America while the rate of unsafe abortion is low or negligible in Europe and north America (Warriner & Shah, 2006). Warriner & Shah, (2006) also examined that about 59% of all unsafe abortion are estimated to occur in adolescent girls below 25 years of age in low-income countries. These girls are also slow to identify pregnancy and are least able to afford proper care and are most vulnerable to ineffective methods.

The teenage mother is also not spared significant biological complications and effects such as increased risk of pre-eclampsia, pregnancy-induced hypertension, anaemia, pelvic fracture, challenging labour and its sequelae (Sunday et al., 2010). Development in the teenager is halted or slowed down as her body has to compete for nutrient with the unborn child hence in situations where poverty and lack of proper nutrition is prevalent at higher levels, both child and mother suffer negative outcomes (Chen, Wen, Fleming, Demissie, et al., 2007).

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Majority of infants and children who are burdened with serious birth defects tend to die earlier than expected (Adams & Muenke, 2008). Those who even survive usually have the potential to be disabled for the rest of their lives possibly due to their condition and lack of proper interventions (WHO, 2003).

Teenage girls in these parts of the world are usually at higher risk of teenage pregnancy due to a lot of diverse contributing factors. In some African countries like Ghana, it has been reported by Kaufman et al (2001); Gadegbeku & Bamfo (2014) that peer pressure, technological advancement and social media coupled with poverty have coerced many girls into the bondage of teenage pregnancy (Kaufman et al., 2001; Gadegbeku & Bamfo, 2014). The situation is worsened when the men involved deny them and leave these young girls to cater for themselves and the babies. There are cases where these teens were raped or do not have the contacts of whoever coerced them into having sex (Warriner & Shah, 2006).

Unfortunately, many children born to these teenage girls face a lot of challenges due to unpreparedness and lack of adequate resources (Anane-agyei, 2011). This unpreparedness sometimes frustrates such teenagers such that they attempt to terminate such unplanned pregnancies (Gadegbeku & Bamfo, 2014). In an attempt to do this, many of such foetus either die in the womb or sustain serious injuries that later present as birth defects when unapproved routes which usually lead to unsuccessful abortions are used (Gadegbeku & Bamfo, 2014). In Netherland, teenage mothers aged 15-19 were seen to have higher risks of stillbirth as compared to women in their 20s (World Health Organization, 2006). It was also observed by the same study that teenage mothers below 15 years have even greater risks. This trend is similar and more severe in developing countries such as Ghana (World Health Organization, 2006).

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In poor communities such as the Agona East district, resources for proper abortion are usually not accessible or known to such teenagers hence they try to use all manner of harmful potions and methods that will harm them and or the growing foetus (Gadegbeku & Bamfo, 2014). Meanwhile, these potions and methods may not yield to successful abortions hence leaving these infants with structural or functional injuries. Most young girls use herbal preparations that have been put together by uncertified practitioners or their fellow peers who claim expertise in such acts (Gadegbeku & Bamfo, 2014). Though more than 60% of Africans rely on herbal medications for their health, there are some herbs that may pose as threat to pregnancies and could lead to injury or partial abortion in the unborn child (Laelago, 2018). Some teenagers also obtain drugs from pharmacies but these drugs may have been poorly stored, expired or completely fake but still pose as harmful substance to both mother and child (Adamecz-völgyi et al., 2017).

It is also not uncommon that there are quack medical practitioners who may be contributing to harmful and improper abortion practices that may lead to unsuccessful abortions that result in severe damage to both the foetus and the mother (Gadegbeku & Bamfo, 2014). There is also a category of birth defects which results from wrong pairing of partners (Adamecz-völgyi et al., 2017). Sickle cell is one of such birth defects which could be prevented by proper pairing of partners (Osbourne, 2011). Most teenagers do not know the sickle cell or health status of their partners before pregnancy results. Interventions targeted at premarital screening and counselling does not benefit most teenagers due to this issue of unplanned pregnancies (Chandra-Mouli et al., 2014)

HIV and other sexually transmissible diseases that could infect and affect the unborn child are also risk factors that could pose concerns to the health of a child of a teenager since pregnant teenagers

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may have been exposed to such diseases by not abstaining from sex or using proper protection (Konadu Gyesaw & Ankomah, 2013). In a study, involving 203 children, to find the prevalence of congenital malformation in children birthed to HIV infected mothers, it was found that more than 20% of the children had HIV too and about 30% of them had at least one type of birth defect (Tudor et al., 2014). The rate of birth defect in this population was associated with HIV hence teenagers face a triple risk by having unprotected sex. Thus, the risk of getting HIV and the risk of transmitting HIV to their unborn children and also exposing same children to birth defects is higher in the unsuspecting teenage girl.

Lack of proper nutritional support is also one of the key factors that affect the health and physical development of both mother and child. It has been suggested that some young girls trade sex for money in the Central region of the country due to poverty and lack of adequate source of basic needs such as food, clothes, sanitary pads and the like (Konadu Gyesaw & Ankomah, 2013). This means that these girls and their families already find it hard to survive hence catering for the extra cost that comes with pregnancy, delivery and care of new-borns is totally an unbudgeted and overwhelming issue. In some of the cases, the men responsible for these pregnancies are not even found. This may cause the teenage mother and her child to suffer lack of proper nutrition which could amount to poor health of both mother and child and could also result in birth defect in these children (Chen, Wen, Fleming, Demissie, et al., 2007).

Studies show that poverty and poor socioeconomic advancement contribute to birth defect possibly due to lack of macronutrients and micronutrients and increased exposure to teratogens from alcohol, smoke and infection (Christianson et al., 2008). Poor teenagers sometimes have to work under unhygienic conditions with their pregnancies and sometimes with their young babies and

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thereby exposing the children to potential risk factors that can affect the development and health of their babies (Liang & UNFPA, 2013). More than half of teenage girls in developing countries are anaemic and lack essential nutrient such as folic acid, iron, and other supplements which could help their biological development hence predisposing them to higher risks of preterm, low birth-weight babies and babies with physical deformity (World Health Organization, 2006). WHO in this study also observed that stress and lack of social support during pregnancy of the adolescent contributes to higher risk of preterm labour which has other grave implications for the child's health.

In a nutshell, still births and death of infants within their first week of life are about 50% higher in children birthed to adolescents as compared to those birthed to women in their twenties (Liang & UNFPA, 2013). Some of the children that survive usually have to deal with lifelong defects and ill health (Liang & UNFPA, 2013). 70 percent of birth defects could either be prevented or the children affected could be offered early interventions and rehabilitation that could be lifesaving or significantly reduce disability (WHO, 2013).

1.2 Problem Statement

Teenage pregnancy and its associated complications is a global issue of concern (Rhode, 2018). The adverse effects of teenage pregnancy affect not only the victims but their families and community too. As observed by Ventura et al "childbearing at early or late ages may be associated with a high risk of adverse outcomes for both mother and child" (Ventura et al., 2019). Every year, it is estimated that more than 20 million adolescents between 15 to 19 years and about 2 million adolescents under 15 years become pregnant in developing countries (UNFPA and Save the

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Children, 2009). Subsequently about 16 million girls aged 15 to 19 years and 2.5 million girls under age 16 years give birth in developing regions (Liang & UNFPA, 2013).

In Ghana, the situation is worrisome especially in rural communities. In 2014, it was recorded that more than 75,000 teenagers aged 15 to 19 years got pregnant and about 20% of this was recorded in the Central region alone (Arquitectura et al., 2015).

Globally, it is seen that adolescents account for more than 13% of all maternal deaths and also stillbirths and death of new-borns are 50% higher among children of teenage mothers as compared to their counterparts in the age range 20-29 years (Rajoriya & Kalra, 2015). Rajoriya & Kalra, (2015) also found that teenage mothers and their babies are 15 times more likely to develop birth complications and possibly lose their lives or sustain disabilities due to a myriad of disadvantages surrounding adolescent pregnancy. In another study, Adamecz-völgyi et al., (2017) analysed the impact of abortion restrictions on birth outcomes using existing data of unsafe abortion in relation to the ban on abortion. The study noted that in the periods where abortion was banned, the prevalence of unsafe abortion was significantly higher among the youth. The study further noted that even though a number of these abortions were successful, there were significant number of them that were unsuccessful which subsequently resulted in birth of a child.

The study outcome showed that as unsafe abortion increases, the number of children born with defect increases among teenage mothers. In other studies, it has been established that failed abortion has consequential effect on the health status of the child (Atakro et al., 2019; Mukhopadhyay et al., 2010). Fonseca et al. (1993) in a detail analysis explains that one of the most common birth defects on children after failed abortion is musculoskeletal and congenital

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malformation of the scalp and cranium of the child. In all studies, there is that link that exists between increase use of over-the-counter drugs or abortion drugs and birth defect. It has been therefore been observed that unplanned pregnancies, as most of these adolescent pregnancies could be called, have a pathway which increases the risk of complications for both mother and child (Mukhopadhyay et al., 2010).

Adomako, (2017) in a study in the central region and some parts of Ghana reported that the occurrence of birth defect over the last five years had increased with majority of them associated to teenage mothers. Increasingly, children born to teenage mothers continue to develop some different levels of defect which hitherto were not directly linked to teenage mothers. The 2017 Ghana Maternal and Health Survey also indicated that the rise in birth defects among children in recent times is alarming and recommended various interventions developed to address this emerging challenge (GSS & GHS., 2017). Largely, the survey attributed some of these occurrences to increase in teenage pregnancies in the country as well as sexual abuse that results in unwanted pregnancies even in the adult. Unfortunately, Central Region remains one of the areas with high records of teenage pregnancy and pregnancy-related challenges (GSS & GHS., 2017).

In the Agona East District within the Central Region, cases of birth defects such as congenital heart disease, down syndrome, cleft lip, spina bifida, club foot, cerebral palsy, developmental delays etc have been recorded in some children of teenage mothers in health facilities. Within a period of two years, more than 40 cases had been recorded by the district in the main district hospital (GHS/Agona East, 2018). These are only the reported cases that are known to district health authorities. The district continues to remain one of the districts in the region with high teenage pregnancies and children with birth defects (GHS/Agona East District, 2018). The

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enormity of the problem in terms of numbers of birth defect may not be known since there are pockets of cases that are not reported but are treated as spiritual problems in either a traditional home or a prayer camp (Adomako, 2017). As the rate of teenage pregnancy continues to increase in the district, the probability of birth defect increasing in the district is high.

Due to the fear of intimidation, harassment, poverty and the lack of knowledge, most teenage mothers are unwilling to go to the health facility for ANC sessions as well as report cases of birth defect (Atuyambe et al., 2008). This denies young teenage mothers from accessing quality healthcare during pregnancy and after delivery. The economic status of the people and lack of recommended health amenities in the Agona East district are also contributors to poor pregnancy outcomes in the district (GSS et al., 2017). Low level of education and lack of jobs for the youth further exposes young adults to diverse disadvantages and limitation (Ghana Statistical Service, 2014). Children of teenage mothers sometimes grow up to also suffer the same fate as their mothers hence repeating the cycle of ignorance and destroyed future due to improper upbringing and lack of adequate resources to ensure proper schooling and development of the child (Christianson et al., 2008). This sequence could result in birth defect since this cycle of mothers are not biological matured and properly nourished to produce healthy babies (WHO, 2013).

Despite these challenges, the district is unable to emphatically state the prevalence of birth defect in the district since data on these cases are scarce. It is therefore important that this research is conducted to go beyond the facility records to ascertain and determine the prevalence of birth defect among teenage mothers. Similarly, the study sought to further unearth the factors that influence the prevalence of birth defects among the teenage mothers. There have not been any known research conducted in the district that seeks to identify the challenges of birth defects

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among teenage mothers. Studies that have been conducted in the Central region have focused on general birth defect without limiting it to teenage mothers.

1.3 Justification of the study

The literature on birth defects in children of teenage mothers in Ghana and Central region is limited. In Agona East District, there has not been any such study to estimate the prevalence of birth defects among teenage mothers. This study highlighted the prevalence of birth defects and the possible factors that contributes to the occurrence of birth defects in the area. This provides an opportunity for further studies to be carried out. Not only does the study outcome provide a platform for further studies to be caried, it also provides recommendations on possible intervention areas that can be outlined to address the identified challenges in the district. Stakeholders in the health sector can only develop and provide appropriate intervention towards a problem if there is data available to highlight the enormity of the problem. This study has clearly outlined the key areas that require appropriate intervention within the health system. This research also tried to fill the knowledge gap by exploring factors which might be responsible for increased risk of birth defect in teenage mothers.

Community-wide education and engagement on addressing teenage pregnancy challenges require adequate data. Without which community level education and advocacy may be irrelevant. This study provides adequate data which can be used for community education and advocacy. Similarly, the results of this study can be used for inferences and generalisation especially for adjourning districts while other study references can be made to this.

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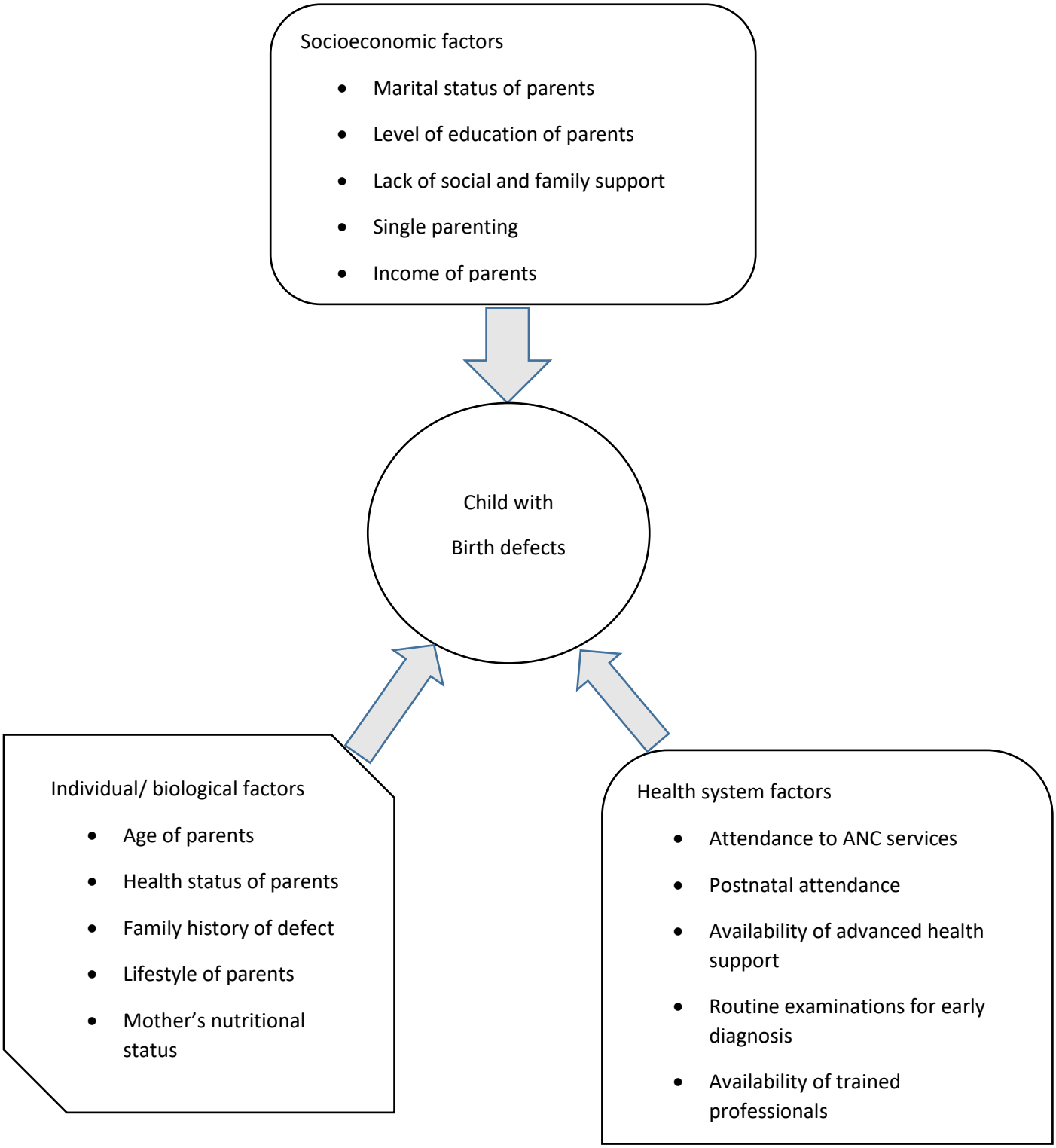
1.4 Conceptual Framework (Figure 1)



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1.4.1 Conceptual framework narrative

The framework above outlines the various risk factors associated with birth defects in children of teenage mothers. It follows that the risk of a teenager giving birth to a child with birth defect is directly and indirectly correlated with socioeconomic status of the community, individual factors and health system factors (Ventura et al., 2019). The likelihood that communities with poor parental control and guidance would have teenagers getting pregnant is also high. There are communities that also encourage early marriage and betrothal of young ladies to older men (Kozuki et al., 2013). This would also influence the likelihood of more teenage girls getting pregnant which would in turn influence the likelihood of them giving birth to premature babies or children with defects.

There are many teenage mothers who got pregnant for men they do not know or have lost contact with. This is common in instances of transactional sex, coerced sex or even rape which are all very common in the region. This creates a difficult situation for an already young girl to be a single parent to face the huge task of caring for a baby. There are situations where these teenage mothers have to work to earn a living alongside caring for their babies. These makes it difficult for both new mother and baby to access proper care and nutrition.

It can also be argued that birth defect would be more common in children of mothers who have poor socioeconomic support especially in single parenting where girls are unable to identify or engage the man responsible for their pregnancies. When spouses are married, teenage mothers receive adequate financial and emotional supports from their husband and both families hence reducing the likelihood that she would be starved or attempt an abortion, both of which are injurious to the health of the mother and her unborn child (Behnke & Smith, 2013).

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Ladies who are well educated make more efforts not to get unwanted pregnancies and if they do, they are more likely to make informed decisions concerning it. For instance, an enlightened teenage girl who got pregnant out of wedlock may be less likely to try to abort with poisonous substances (Langridge et al., 2013). She is also more likely to attend antenatal care and deliver in a health facility.

In situations where there is enough social and economic support, the mother and her unborn child are properly catered for, hence reducing the probability of a defect occurring in the unborn child (Adams & Muenke, 2008).

A myriad of individual factors may influence a teenager's likelihood to give birth to a child with birth defect based on individual factors such as her age, her health status, the age of her partner, family history of both parties.

The third major factor influencing a teenage mother's likelihood of giving birth to a child with birth defect is the state of the health system available to her. A poor and unsupportive health system is likely to commit errors, omissions and actions that would not be favourable for proper antenatal care or delivery (Rhode, 2017). There are some facilities that do not have adequately trained health professionals to handle the health issues of these teenagers in some communities in the central region. Access to appropriate healthcare facility could be a daunting task for some girls. Sometimes even transportation to these facilities could be a problem hence some girls travel by motorcycles to these facilities and some go into labour while on some of these journeys leading to birth complications. In these rural areas, there have been miscarriages, stillbirths, birth defects and

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many other complications that arise from lack of proper transport system or poor roads to access recommended health facilities.

Lack of adequate resources in these facilities could also pose serious implication for teenage mothers. Many hospitals and medical centres that provide maternity services may not be properly equipped or resourced to handle complicated deliveries.

1.5 Study Objective

1.5.1 General objective

To **determine** the factors associated with birth defects in children of teenage mothers in the Agona East District of the Central Region of Ghana.

1.5.2 Specific objectives

1. To determine the proportion of teenage mothers who have children with birth defects
2. To assess the socio-demographic factors associated with birth defects in children of teenage mothers
3. To determine the maternal health factors associated with birth defects in children of teenage mothers
4. To examine individual risk factors associated with birth defects in children of teenage mothers
5. To explore the perceptions and knowledge of the teenage mother about birth defect

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1.5.3 Research questions

1. What proportion of teenage mothers have children with birth defects?
2. What are the socio-demographic and economic predictors of birth defects in children of teenage mothers?
3. What are the individual predictors associated with birth defects?
4. What are the health system predictors of birth defect in children of teenage?
5. What is the teenager's level of knowledge and or perceptions about birth defects?

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CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This section provides the review of various literature on teenage pregnancy and birth defects. In line with the research objectives, the topics reviewed included teenage pregnancy, prevalence of birth defects, risk factors associated with it, impact on children and their families.

2.2 Teenage pregnancy

Every year, it is estimated that more than 20 million adolescents between 15 to 19 years and about 2 million adolescents under 15 years become pregnant in developing countries (Darroch et al., 2016). Subsequently about 16 million girls aged 15 to 19 years and 2.5 million girls under age 16 years give birth in developing regions (UNFPA and Save the Children, 2009).

In Ghana, the situation is worrisome especially in the rural communities. In 2014, it was recorded that more than 75,000 teenagers aged 15 to 19 years got pregnant and about 20% of this was recorded in the central region alone (Arquitectura et al., 2015).

Literature has revealed that adolescent mothers are usually poor and care for their children in impoverished circumstances that are hard to either escape from or improve upon (McDermott, 2004). There are many situations when teenagers are forced into premarital sex, coerced or sexually abused against human rights resulting into unwanted pregnancies (Kumar et al., 2007). Teenage mothers and their children are at risk of long-term disadvantages and complications due to lack of preparation and the maturity that is required of the teenage parent (World Health Organization, 2006).

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Teenage pregnancy is usually not a onetime event in some situations, repeat pregnancies and subsequent childbirths are also likely to occur while conditions may not have improved substantially hence escalating the difficulty of taking care of the situation (Violet et al., 2020).

It is widely known that infant mortality increases as the age of the mother decreases or increases beyond the limits of the reproductive age group; teenagers who give birth before the age of 15 years are five times more likely to die during pregnancy or delivery as women in their 20s, partly as a result of physical immaturity (World Health Organization, 2006). Also, adolescents are more likely to die during pregnancy and delivery as compared to women in the reproductive age group above 20 years (UNFPA and Save the Children, 2009).

In poor communities in Ghana and other regions in sub-Saharan Africa, teenage mothers are significantly disadvantaged and usually face tremendous challenges during pregnancy and early motherhood. Younger mothers face higher rates of complication during pregnancy and childbirth. The risk of poor maternal and child outcomes such as maternal and infant mortality, morbidity or of having small birthweight babies is higher in teenage mothers when compared with the adult mother (Pérez et al., 2017).

A research on teenage fertility shows a rise of 4.8 million childbirths to teenage girls between 15 and 19 years in the years 1995 to 2020 in the number of births of teenagers in sub-Saharan Africa (Kaufman et al., 2001). Research undertaken in Swaziland has shown that young mothers have difficulties in a variety of areas. Lack of assistance from individuals and institutions, including educational, social, cultural and financial matters, were part of their top concerns (Kaufman et al., 2001).

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It has been observed that Ghana is one of the country's that has the highest child marriage prevalence rates in the world. Twelve percent of girls aged 15–19 years are either pregnant or have already given birth and giving birth and living with the man responsible signifies marriage in many communities in Ghana (Ghana Statistical Service & Ghana Demographic Health Survery, 2008). Children who are pushed into early marriages are more likely to give birth at teenage age which consequently influences the outcome of birth (Konadu Gyesaw & Ankomah, 2013). Despite their marital status, teenage mothers suffer from frequent contraction and pregnancy complications which increases the risk of birth defect (WHO, 2018). A study in the Gomoa West (with over 270 districts in Ghana), a total of 762 teenagers became pregnant in 2012, some of those youngsters were aged between 10 and 14 years and were not married yet (Konadu Gyesaw & Ankomah, 2013).

In Ghana, adolescent childbearing has potentially negative demographic and social consequences, and births to teenage mothers have been found to have the highest infant and child mortality (Ghana Statistical Service & Ghana Demographic Health Survery, 2008). A study in a small rural community located somewhere in Dodowa, a town in Ghana revealed that about 19% of Junior High students had already given birth (Konadu Gyesaw & Ankomah, 2013).

2.3 Introduction to birth defects

Birth defects are inborn errors of development which include any structural or functional anomaly with substantial effect on physical, intellectual and social wellbeing (WHO, 2013). Birth defects represent a considerable and increasing clinical and public health challenge because of their global impact on the health of various populations (Feldkamp et al., 2017). They occur one in 33 births

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and was censured in 2003 to be about 7.9 million babies worldwide ("American Psychological Association," 2003). Birth defects are among the core causes of mortality and morbidity in infants and children under five years of age (Bello et al., 2013). Bello et al (2013) also found that pregnant women aged 20 to 30 in Ghana have moderate knowledge about birth defects and this is higher than what is reported among teenage mothers.

The World Health Organization (WHO) defined birth defect as structural or functional anomaly seen usually at birth (WHO, 2013). Advancement in medicine and medical technology has led to a considerable reduction in infant and childhood mortality in most countries in the last 20 years (WHO, 2013). This reduction is possibly due to immunization, control of childhood infections, vaccination and availability of new medications for malaria and other types of malaise. As a result, it has been observed by March of Dimes (Christianson et al., 2008) that birth defects are a key cause of a greater proportion of infant and child mortality. From the demographic and health surveys, it has been found that births to teenage mothers (age 15-19 years) tend to record the highest infant and child mortality in Ghana (Liang & UNFPA, 2013).

Information et al., 2003 found that more than 20% of infant mortality in 2005 was due to birth defects making birth defects one of the leading causes of death in the first year of life. They also observed that children who even survive birth defects often have to deal with lifelong disabilities such as intellectual disability, cardiac problems, and or limitations in performing activities of daily living (ADLs) (EPA, 2003).

Birth defects have not received the needed attention as a major cause of infant and childhood mortality and morbidity due to the misperception that they are uncommon. There is therefore low

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funding commitment from governments, NGOs and healthcare providers. Also, there is poor documentation and statistics regarding birth defect and their influence on the survival of the young child (WHO, 2013).

It is however, unacceptable and inhuman that children should become victims of preventable birth defects. This means any child with a preventable birth defect is a failure of medical care and public health systems that completely ignore available preventive measures (WHO, 2013). This failure is also due to lack of organized effort and political will that are needed to implement the necessary interventions.

2.4 Causes of birth defects

Birth defects can be due to intrinsic errs in a body structure causing a malformation or as a result of an external force damaging a well-formed body structure leading to a deformation in the developing child. Some defects are detected before the child is born while others are only detected long after birth.

A number of birth defects are inherited from parents or family lineage. Others have risk factors which include prenatal exposure of the foetus to certain pharmaceuticals, harmful herbal preparations, alcohol and smoke (EPA, 2003). It is also seen that insufficiency of folate in a woman's diet is a key contributing factor to birth defects.

Chromosomal inadequacies, genetic anomalies, environmental teratogens and some nutritional deficiencies account for some congenital anomalies. Harmful substances, smoking and poor lifestyles in women could also lead to congenital malformations and deformations (Martin et al.,

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2019). Also, poor delivery method or improper handling of new born babies could result in a structural defect. However, there are many congenital anomalies that are of unknown aetiology (Chen, Wen, Fleming, Yang, et al., 2007).

Adane et al., (2020) conducted a systematic review on prevalence and associated factors of birth defects among new-borns across countries within the sub-Saharan region. The analysis reviewed 43 studies that had centred on birth defects. With about 29 studies across different countries, the study estimated the prevalence of birth defect at 20.4 children per 1,000 live births. The study noted that for children with birth defect, commonest among them were musculoskeletal defect. Among the various variables that were reviewed, the significant factors that caused birth defect in all the studies included the absence of folic acid supplements for pregnant mothers, the presence of chronic disease during pregnancy and the intake of drugs most likely containing chloramphenicol. For pregnant teens who took chloramphenicol and other non-approved drugs, the risk of their babies developing birth defect is 14.6 times higher than the children whose mothers did not take any drug during pregnancy.

Similarly, children whose parents had a chronic disease during pregnancy have 6.1 times higher risk of developing birth defect than those whose mothers did not have any chronic disease during pregnancy. Also, a study by Bernpechat & Janine, (2015) revealed that the teenage girl is 6 times likely to die from maternal problems and delivery compared with their counterparts above 20 years. The children of these teenagers are also more likely to have a higher incidence of toxaemia, anaemia, nutritional deficiencies, low birthweight, and retardation than infants of older women in the same population (Bernpechat, 2015). Teenage girls are also at increased risk of giving birth to preterm and low birthweight babies (Ash & Ogakwu, 2014).

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Brusselen et al., (2020) conducted a case control study among new-borns with visible birth defects and neonates who had no visible birth defect but were born in the same facility. Among other things, the study sought to ascertain the causes of neonatal birth defects in relation to exposure to copper mining radiations. The study assessed whether women exposure to traces of metals had any effect on birth defect on the children born to these women. The results among the neonates with exposure to copper particles showed that vitamin consumption during pregnancy reduced the risk of birth defects while working outside the house during pregnancy within the copper mining environment increases the risk of birth defects. However, birth defect was not significantly associated with direct contact to zinc particles. Neonates with particles of zinc in their blood samples did not necessary sustain birth defect (Brusselen et al., 2020).

Birth defect was observed to be a major concern in some cities in Brazil in the mid and late 2000. In some areas, the main cause of the defects were not well established. Ive et al., (2011) conducted a clinical and genetic study in some parts of the country to help estimate the prevalence of birth defect, the main causes and the associated consequences for birth defects. For assessment of the presence of birth defects, the researchers used physical assessment, photographic records and other medical reports from various hospitals that were included in the study. The study observed a lower incidence of birth defects of 2% as compared to other studies that had been done earlier of which reference were made to the study. The commonest birth defects that the study observed include isolated congenital heart disease and down syndrome. Significantly, the study observed an association between birth defects and maternal age, parental consanguinity, and the susceptibility of the family. Again, exposure to teratogenic agents by the mother during pregnancy was

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significantly associated with birth defect. Two main consequences were observed in the study: prolonged hospitalization and death.

Feldkamp et al., (2017) in analysing the aetiology and clinical presentation of birth defects in children who were born between 2005 and 2009 recruited more than 5,000 children with some level of defects. For known aetiology assessment, the study looked at chromosomal effect, genetic factors and human teratogen. The prevalence of birth defects for this study was 20.2%, a prevalence which was noted to be one of the highest. Comparatively, chromosomal and genetic factors constituted nearly 95% of the total birth defect cases. For the remaining 5% causes, the study observed twinning and human teratogen as the associated factors. Lancaster, (2011) assessed the causes of birth defects making reference to history of birth defects. The study reviewed previous records on environmental conditions that may cause birth defects in children. The study on environmental factors were compared with maternal infections, therapeutic drugs and maternal hyperthermia and was concluded that both the environmental factors and other related conditions had same conditions and features. The study noted that exposure to environmental conditions and other therapeutic radiations increases the risk of birth defects in the children. In another study, the incidence of birth defect was significantly influenced by gender in that male children had higher risk of getting birth defect as compared to female children (Khandekar & Jaffer, 2010). Again, Khandekar & Jaffer, (2010) explains that women who give birth at gestational age of <37 weeks had higher risk of giving birth to children with defects.

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2.5 Complications in teenage pregnancy

The global social issue of teenage pregnancy has significant consequences on mother and child health, in particular in developing countries (Mukhopadhyay et al., 2010). Teenage pregnancy has become a global epidemic that is causing severe pressures in already overwhelmed health system. The fact that 90% of these pregnancies are unplanned and unwelcomed with joy of parenthood already deprive them of the needed preparations and readiness that children usually require. Statistics indicate that pregnant teenagers are more likely to terminate the pregnancy than proceed with the birth (Edessy et al., 2014). Many of the young married girls also suffer from malnutrition. Nearly 47% of adolescents have an index of body mass under 18.5, about 11.4% are stunted and half of them have anaemia (International Institute for Population Sciences, 2007). This is of serious concern because maternal age and health play a significant role in adverse outcome and complications of pregnancy.

Teenage pregnancies represent a high-risk group in reproductive terms because of the double burden of reproduction and growth. Complications of pregnancy and childbirth are the leading cause of mortality among girls aged 15-19 years in developing countries (S., 2004). However, early registration of pregnancy and consumption of the recommended number of prophylactic iron folic acid tablets were significantly lower among the teenage mothers. This indicates that the teenage mothers were less careful about their pregnancy probably because of the lack of awareness and maturity (Mukhopadhyay et al., 2010).

Some authors have reported a higher rate of instrumental deliveries in the case of teenage pregnancies (Mukhopadhyay et al., 2010). The possible explanation could be underdevelopment of pelvis in younger mothers and occurrence of cephalopelvic disproportion more frequently in

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teenage mothers; consequently, the number of instrumental deliveries and caesarean sections was also higher.

The combination of poor nutrition and early child bearing expose young women to serious health risks during pregnancy and childbirth, including damage to the reproductive tract, pregnancy related complications, such as anaemia, pregnancy induced hypertension, preterm labour, cephalopelvic disproportion, maternal mortality, perinatal and neonatal mortality, and low birthweight (Rajoriya & Kalra, 2015).

Pregnancies occurring outside wedlock have the risk of being terminated in unsafe abortions by quacks and often do not reach the tertiary hospital (Mukhopadhyay et al., 2010). This act sometimes results in incomplete or unsuccessful abortions. The drugs, concoctions and brutal methods used by teenagers in this dilemma have serious consequences for the survival of both mother and child. The damages caused by these harmful substances and practices are sometimes presented as injuries to developing body parts of the children resulting in birth defects of all kinds. Adverse outcomes of teenage pregnancy arise not only from physical and medical causes but are also associated with individual, familial and sociocultural factors besides lack of access to healthcare, contraception, and other resources which is the prevailing situation in most developing countries (Mukhopadhyay et al., 2010). Low levels of literacy adversely affect reproductive and sexual health awareness and, thus, quality of life (Mukhopadhyay et al., 2010). In a study comparing teenage mothers with their counterpart in their twenties, birth-asphyxia was the most common neonatal complication in both the groups, it was significantly higher in the teenage-group compared to their older counterparts. Deaths of new-borns within 48 hours were also higher in the case of the teenage mothers (Mukhopadhyay et al., 2010).

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The teenage mothers had a significantly higher number of preterm deliveries compared to the adult mothers while the reverse was noted in post-term deliveries. Such a high incidence of preterm labour leads to higher risks for neonates. Many authors from developed countries have reported an association between teenage pregnancy and preterm delivery (Mukhopadhyay et al., 2010). Low birthweight is a key predictor of malnutrition and an important determinant of child mortality and the likelihood that the child would develop birth defects. One of the most detrimental outcomes of low birthweight is growth retardation, and if the new-born happens to be a girl, it perpetuates a vicious cycle of female malnutrition throughout adolescence and adulthood. This process gives rise to a condition of intergenerational transmission of physical (small mothers have small babies), social and economic disadvantages into the next generation (Mehra, 2001). The present study found that the number of low-birthweight babies was more in the case of teenage mothers (38.9%) compared to the adult mothers (30.4%). Babies born to teenage mothers are likely to be premature, and hence, the incidence of low birthweight and structural malformations are higher in them (Rajoriya & Kalra, 2015).

The proportion of stillbirths was also higher (5.1%) among the teenage pregnancies (Mukhopadhyay et al., 2010). Out of the neonatal complications, neonatal deaths and birth-asphyxia were significantly higher in the teenage-group compared to the adult primigravida women possibly due to the greater number of premature births. They developed more perinatal complications, such as preterm births, stillbirths, birth defects and neonatal deaths, and delivered babies with low birth weight compared to the older mothers. The adverse outcomes of teenage pregnancy could be attributed not only to lower maternal age but also to their relatively disadvantaged socioeconomic background and the history that underlined the pregnancy.

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It is observed that teenage pregnancy has impact on economic development and increases the dependency ratio of a nation and thus has no positive means to improve sustainability (Sunday et al., 2010). The high rate of school dropout of teenage mothers further changes the destiny of those girls by denying them or at least making it impossible for them to unravel their full potentials. The fact that some of these girls die from the pregnancy, sustain chronic injuries and ailments or give birth to a child with birth defect further makes it a complicated and undesirable impact on a nation (Bernpechat, 2015). The future of teenage mothers is even clouded with serious challenges in obtaining a good paying job which would enable them to look after their children especially in single parenting.

2.6 Incidence of unsafe abortion among teenagers and its consequences on birth defect

In some developing countries, abortion remains a major challenge since its legalization continues to remain a contentious subject. In Ghana for instance, abortion law and policy has been limited to emergencies and subject to medical interpretation (Atakro et al., 2019). Maranhão et al., (2016) conducted a study in Brazil in Piaui State among teenagers on predictive factors of abortion. The study noted that abortion was very common among teenagers and some of the reasons that were associated with high abortion included having at least one pregnancy before or giving birth before and societal stigma. It was further observed that some of the teenagers were pressured by either their partners or family members and/or were influenced by peers to commit abortion.

Largely, more than half of these abortions were done in an unsafe condition. In India, it was noted that nearly 5% of all pregnancies results in abortion among women with an increased proportion among teenagers (Yokoe et al., 2019). However, despite abortion being legal in India, the study

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by Yokoe et al., (2019) noted that more than 67% of all abortions in India are classified as unsafe abortion. In North Central of Nigeria, 100% of all participants in a study said they used unapproved abortion to terminate their pregnancies (Sunday et al., 2010). Abortion-related deaths continues to increase as a result of these unsafe practices and contributes to the national maternal mortality rates. The study noted that unsafe abortion was significantly determined by age (girls less than 25 years), illiteracy, rural residence and poverty. In another study, in Nigeria, on the burden of unsafe abortion among teenagers, Oseni et al., (2020) observed a very disturbing situation. The study was conducted among 423 sexual active teenagers in Edo State. The study noted that of the 423 sexually active teenagers who participated in the study, 67.4% have had abortion prior to the study. For those who have had abortion prior to the study, more than 75% of the girls have had unsafe abortion and these were significantly influenced by socio-economic status, reproductive tract infection, age and not married and its conequence of community shame.

In Ghana, the study by Atakro et al., (2019) in a qualitative study examined why teenagers are more comfortable using unsafe abortion. The results were categorized under seven thematic areas included absence of knowledge among teenagers on the existence and place for safe abortion, socio-economic factors, the purported taboo and stigma attached to safe abortion even in health facilities and societal stigma associated with teenage pregnancies. Other factors that were observed included not to have children before marriage, desire to further education until appropriate time for marriage and trying to avoid expression of disappointment by parents who may have trusted them.

Adamecz-völgyi et al., (2017) analysed the impact of abortion restrictions on birth outcomes using some existing data of unsafe abortion in relation to the ban on abortion in Ghana. The study noted

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that in the periods where abortion was banned, the prevalence of unsafe abortion was significantly high among the youth. The study further noted that even though a number of these abortions were successful, there were significant number of them that were unsuccessful which subsequently resulted in birth of a child. The study outcome showed that as unsafe abortion increases, the number of children born with defect increases among teenage mothers. In other studies, it has been established that failed abortion has consequential effect on the health status of the child (Atakro et al., 2019; Mukhopadhyay et al., 2010).

2.7 Economic and Health system factors

The teenage mother is not only disadvantaged by her age but also has limited access to healthcare options due to many dynamic factors (Nguyen et al., 2017). This disadvantage has been investigated to be possibly due to lack of knowledge, lack of matured decision making powers, lack of money, cultural limitations to accessing healthcare (World Health Organization, 2006). The economic design of the health system in developing nations offers the adolescent too little support too late when they most need it (Rhode, 2018). This is the case because most of its design were built for the needs of the matured who are able to patronise it. Most adolescents do not have sufficient family and partner support during pregnancy to enable them to patronise their health needs immediately (Nguyen et al., 2017). Most of them are also shy to show up to health facilities due to the unfavourable treatment some of the healthcare workers give them because they got pregnant too early (Vanphanom Sychareun et al., 2018). This is especially common in the rural communities. Teenagers who are even able to master courage to visit health facilities during their pregnancies are unable to pay for services, buy medications such as folic acids and undertake important pregnancy tests such as scans that help to monitor the presentation of their unborn babies

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(Vanphanom Sychareun et al., 2018). Most rural communities in Ghana lack sophisticated amenities that would help manage pregnancy related complications. Pregnant women who live in these communities need to travel long distances on poor roads to access these amenities. In the Agona East district, poor roads have been reported to contribute to miscarriages and pregnancy related complication (Adomako, 2017)

Rich and advanced countries have now been able to improve patient care such that death and disability are being tackled relatively better than they are being tackled in low and middle-income countries (WHO & World Bank, 2018). Their health transition has therefore advanced to include disabling conditions especially ones occurring in infants (Christianson et al., 2008). They also have lesser incidence of teenage pregnancy due to improved coverage in contraceptive usage, easy access to legal and medical abortion and birth defect (World Health Organization, 2014). This accounts for lesser prevalence of birth defects and other negative outcomes of teenage pregnancy in the developed world.

About 85% of the world's population currently live in low and middle income countries which do not have comprehensive services for care and prevention of disabling conditions like the birth defects (WHO, 2003). The insufficient number of health facilities in rural communities in developing countries is one of the major contributors to maternal health complications.

Teenage mothers are usually faced with many challenges that they were not matured and prepared for in carrying their pregnancy, delivery and caring for new-born babies (Konadu Gyesaw & Ankomah, 2013). When teenage mothers receive adequate attention and sufficient care during their pregnancy and child delivery, incident of complications are greatly reduced (Ash & Ogakwu, 2014). Ash & Ogakwu also observed spontaneous vaginal delivery increases with multiparous

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teenage mothers just as it is established in the literature concerning older women in their reproductive ages. This could be attributed to multiparous teenage mothers having more knowledge, experience and courage to receive adequate and timely healthcare in subsequent pregnancies as compared to first timers (Vanphanom Sychareun et al., 2018).

2.8 Efforts in prevention of birth defects in children of teenage mothers

Prevention of birth defects in children of teenagers is a very dicey and complicated but essential goal that must be looked at from many facets. The teenager has issues that are multiple and diverse in nature. Breaking the barrier of lack of knowledge and poverty, availability of teen health services that are also friendly, availability and accessibility to protective and safe sex among sexually active teens, these are important to be able to decrease teenage pregnancy in rural areas. However, to prevent birth defects would even require more stringent measures.

Public health interventions, including avoiding sexually transmitted diseases, laws regulating the handling of harmful substances (e.g. some farm chemicals), rubella vaccine, and fortification of essential foods with micro-nutrients, will reduce birth defects of environmental origin (iodine and folic acid).

The timely identification of a family risk of inherited disease, and carrier screening with genetic counselling, enable couples to limit family size where there is a known risk (Adams & Muenke, 2008).

Prevention during pregnancy requires risk identification and management. Some of the interventions and services related to this can raise ethical, legal and social issues and may have

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cost implications (Adams & Muenke, 2008). Such services include prenatal screening and diagnosis for birth defects, selective termination of pregnancy, and the availability of counselling services. Minimally invasive screening methods are currently available, such as taking maternal blood for the measurement of several metabolites in the maternal serum (Adams & Muenke, 2008).

The detection rate of congenital disorders in the first trimester through biochemical screening is improved when it is undertaken in tandem with ultrasound screening involving nuchal translucency and other ultrasonographical assessments. Ultrasonography in the second trimester is useful to detect major structural defects (Adams & Muenke, 2008).

Screening of new-born infants for congenital disorders facilitates early detection, treatment and care. Neonatal screening programmes (physical examination of all neonates and screening for congenital hypothyroidism, phenylketonuria, sickle-cell disease and glucose-6-phosphate dehydrogenase deficiency) and training of primary health-care providers support the diagnosis and appropriate referral for treatment of infants with congenital disorders. Physical examination of all new-born infants by trained primary health-care practitioners is feasible in most health systems and allows the identification of many birth defects, including cardiovascular defects that are associated with a high risk of early mortality and referral (Adams & Muenke, 2008).

Preventing young girls from smoking, drug and alcohol abuse would also go a long way to help decrease the likelihood of their children subsequently developing birth defects (Behnke & Smith, 2013). In teenage settings, there must be education to inform young people of the dangers of using unapproved methods and concoctions to terminate a pregnancy (Martin et al., 2019). Parents and all stakeholders in the society should be committedly involved in solving the problem. The stigma

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associated with teenage pregnancy and birth defects are both very disturbing hence a teenage girl with a child with birth defect faces even more challenging situation.

There have been important policies and strategies taken by governments in low- and middle-income countries to curb the menace of teenage pregnancy and reduce its ill effects but most of those policies are short lived because they are underfunded, poorly executed and not engaging teenagers as much as they should. In 2009, UNFPA developed a comprehensive toolkit to tackle adolescent sexuality and reproductive health looking at how adolescents could be engaged to fight their own battles and overcome the challenges of teenage pregnancy and its ill effects (UNFPA and Save the Children, 2009). It was expected that more children in rural areas would be reached and saved through this project. The tool has over the years remained a major guide to all countries and stakeholders in addressing the challenge of adolescent reproductive health. A status report on adolescent reproductive health by Save the Children in 2018 revealed that the rate of use of adolescent reproductive health methods and products have increased over time, though not at a rate as expected (Save The Children, 2018). Warriner & Shah, (2006) also motioned that unsafe abortion does not only harm the girl involved but also cost the whole society hence societal involvement in prevention and proper management of such cases is warranted. Unsafe abortion knows no boundaries but it is more present in poor and undereducated populations and this may snatch precious lives and quench little hopes of women who are victims (Warriner & Shah, 2006). It has been observed in a study that 100% of all participant got pregnant in their teens and terminated using unapproved means and abortion was carried out by quacks but none of these quacks or culprits were arrested or even questioned (Sunday et al., 2010). This undermines the

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rights and safety of young girls who have entrusted their lives into the hands of our leadership and health system.

2.9 Summary of the chapter

The chapter has so far discussed the various concepts of birth defect in relation to the study's main objective. The concept of teenage pregnancy and its associated complications to teenage mothers has been reviewed and discussed. The discussion on that showed that teenage mothers face a number of challenges within the society including pregnancy-related stigma and are faced with the challenges of accessing maternal health care. However, limited studies have been done to show the relationship that exist between stigma attached teenage pregnancy and childbirth defect. The challenges faced by teenage mothers are enormous during their pregnancy stage. Increased stigma and other challenges associated with teenage pregnancy push teenagers who try to commit abortion using several unapproved methods. The chapter has thoroughly reviewed various literature on incidence of unsafe abortion among teenage mothers. The discussion on the incidence of unsafe abortion revealed that majority of teenage pregnant mothers who are not willing to keep their babies attempt to abort using unsafe means either through drugs that are purchased over the counter or resort to herbal medication. Literature showed higher prevalence of unsafe abortion in developing countries which is a cause of worry to stakeholders. The relationship between unsafe abortion and birth defect was further reviewed. Most of the studies in Ghana have looked at teenage pregnancies and its effects on maternal health with limited focus on birth defect. Studies on birth defects through incidence of failed unsafe abortion focused generally on women within reproductive age and very few were specific to only teenagers.

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The chapter has also discussed extensively the concept of birth defect. The various forms of birth defects have been explained as well as the factors that are associated with birth defect. Both risk factors and socio-demographic characteristics have all been discussed and explained in the literature. The discussions in this chapter also looked at preventive measures for birth defect among teenagers. Even though literature has not been comprehensive on this, it provides avenue for outlining some of key strategies that can be adopted in ensuring that young girls do not engage in activities that leads to unwanted pregnancies and subsequent attempt for unsafe abortion.

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CHAPTER THREE

METHODS

3.1 Introduction

This chapter introduces the methods that were used to carry out this study. The chapter includes the study design, study area and population. Methods and procedures for data collection and sampling are also outlined here. Also, data analysis and management as well as ethical consideration are also described.

3.2 The study design

This study was an analytical cross-sectional design using mixed methods (quantitative and qualitative) aimed at investigating factors associated with birth defects in children of teenage mothers in the Agona East district of the Central region. A structured questionnaire containing socio-demographic variables (gender, age, education, marital status, family income), clinical variables (health status of teenage parents and their children, presence or absence of birth defect in child) was employed. The quantitative method was the first method applied and it was used to respond and answer the first three objectives of the study while the qualitative approach was used to respond to the fourth and fifth objectives of the study. The qualitative aspect of the study was used to explore the experiences of purposively selected mothers whose children with birth defects. The data was collected from December, 2019 to February, 2020. Data was then entered and analysed from May, 2020 to August 2020.

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3.3 The study area

The study area was at the Agona East District of the central Region, Ghana. It has a total area of $539.7km^2$. Agona East District is one of the 17 districts in the central region of Ghana with Nsaba being its administrative capital. Its total population stands at 113,089 from the 2010 population and housing census (49% males, 51% females). The population of the district is about 3.9% of the total population of the region. Less than half of the total population of the district (44.3%) resides in urban areas with 41.1% of the population been within the Youth category. The district is bounded in the south by Agona West and Gomoa East District in the Central Region, to the north by Birim South District in the Eastern Region and northeast by West Akim in the Eastern and to the east by Awutu Senya. Region (GSS, 2010). Out of the 113,089 total population, 28,384 representing 25.1% are women within the reproductive age while 19.1% of the women within the reproductive age are teenage adolescents aged 15-19 years. In 2018, as presented in the district annual report review, the district recorded 541 teenage pregnancies with 306 teenagers given birth within the same period (GHS/Agona East, 2019). The report further indicated that a total of 1,749 women above 19 years delivered in the district given a total of 2,055 births. The district has only one hospital which is managed under Christian Health Association of Ghana (CHAG) by the Salvation Army. Other health facilities in the district include five polyclinics and four functional CHPS compounds.

Agona East district is a farming community which is known for cocoa, plantain, yellow corn, coconut and brown rice farms. The indigenes are however poor and have limited opportunities for its youthful population. The youth usually make a living from transport which includes taxi, bus (trotro) and motorcycle (okada) (Ghana Statistical Service, 2014). Few of them are gainfully

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employed as teachers, nurses, and shopkeepers. Others are into farming and selling of farm produce in the market.

The district has two main secondary schools which include the Nsaba Presbyterian Secondary school and the Nyamanra Secondary school. Most of its teenagers enrol in these schools or move outside the district after graduating from the Junior high school. A number of them get pregnant in the Junior High school and dropout without acquiring any education certificate (Ghana Statistical Service, 2014). Some of these school dropouts enrol in skill acquisitions such as hairdressing, fashion and catering. A few of these pregnant girls sell on the streets by roaming around with snacks, fruits, foodstuff, and any other mobile sellable item. They do these to support their parents and to also fend for their kids.

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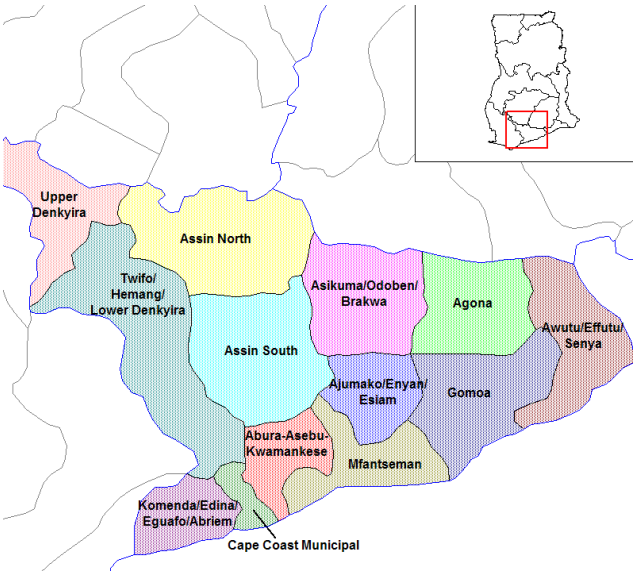

Fig2. Map showing Agona East district in the central region. Fig3. Map showing the area of the district

3.4 Study population

The study targeted teenage mothers who have given birth in the Agona East District in the last two years (2018-2020) with children who under 2 years old. Teenage mothers form a critical component of the reproductive age group within the district. In 2017 alone, of the total births recorded, teenage mothers represented 26.3% which is more than a quarter of the total births. However, teenage mothers form only a-fifth of the total reproductive women population (GSS et al., 2017). Children of these teenage mothers were examined for birth defects using in-depth interviews and mothers who had children with birth defects were then grouped into five focused groups for further discussions with 4-5 participants in each group.

3.4.1 Inclusion criteria

For the purpose of this study, the inclusion included:

1. Teenagers who have given birth in the last two years

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2. Teenage mothers whose children are alive and are under the age of 2 years.
3. Teenage mothers who reside in the Agona East district.

3.4.2 Exclusion criteria

The inclusion criteria also included:

1. Teenage mothers who are indisposed and are too ill to participate in the study
2. Teenager mothers who lost their babies during deliveries or soon after delivery.
3. Children whose teenage mothers are dead or are not available to participate in the study

3.5 Sampling method

This study employed a multi-stage sampling method. First, simple random sampling method was used to select houses in each community for the study. In each community, the first house that was spotted in each community was sampled and subsequently grouped into the 3^{rd}, 5^{th}, 7^{th} etc. Secondly, teenage mothers who met the inclusion criteria were selected using purposive sampling method. In each house where teenage mothers were not available, the next available house as per the categorization was used. For focus group discussions, participants who met the inclusion criteria were purposively selected to be part of the study.

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3.6 Sample size for survey

The sampling method that was used for this study is the simple random sampling and its sample size is calculated below using the Cochran formula and modifying it with the 2018 population of teenage mothers (306).

$N_o = \frac{Z^2pq}{d^2}$ (sample size using Cochran formula)

Z = z score 95% confidence interval, p = estimated prevalence

(p=21.5%), q= complement of estimated prevalence, d= margin of error (5%) and attrition (5%)

N_o =260

$n = \frac{No}{1+\frac{(No-1)}{306}}$ $(modified\ sample) = \frac{260}{1+\frac{(260-1)}{306}}$= 140 + 5% attrition (7)

A sample size of 147 participants was recruited for this study. All participants partook in the quantitative study. For the qualitative study however, a total of 20 participants were involved in the FGDs with each FGD comprising an average of 4-5 teenage mothers. This was done to allow for effective discussion among the teenage mothers. Five focus group discussions were conducted within the study area. Each group was supposed to have 7-10 participants but a few participants dropped out due to shyness and discomfort hence fewer number of participants in each group**.**

3.7 Study variables

3.7.1 Dependent variable

The outcome variable or the dependent variable was a teenage girl with a child with birth defect who is less than 2 years of age. This was measured in terms of the proportion of teenage mothers interviewed who have children with birth defect. The measurement was determined from the number of teenage mothers interviewed.

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3.7.2 Independent variable

The exposure or independent variables of measure are socio-demographic (age, marital status, educational level, gestational age), social support, partner influence, drug abuse, nutritional factor, health status, past and present complications, health system factors. Each of the variable was measured at different levels. All demographic characteristics with the exception of age was measured using categorical variables. The other independent variables were measured either with categorical or discrete variables.

3.8 Data collection

Two data collection tools were developed to gather primary data from the field. For quantitative data collection, structured questionnaires were developed with both open and closed-ended questions. Participant information sheets were read, translated to local languages and explained suitably to various participants and their consents obtained appropriately. The structured questionnaire was then used to obtain quantitative data from participants by interviewing each of them. Quantitative interviews did not exceed an hour for each participant.

Semi-structured interview guides were also developed to guide the key informant interviews. Similarly, discussion guides were developed to guide the discussion for Focus group discussions (FGDs).

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3.9 Data Management and Analysis

The analysis of data was done at different levels. Quantitative data was first entered into excel and then keyed into STATA version 15.0 software for analysis. Using STATA software, various results were generated and reported in frequencies and proportions and presented in tables. To test for association of independent variables against the dependent variables at bivariate level, chi square tests were run and associated p-values were reported. Significance level of each bivariate test conducted was set at 95%. To further test the strength of the relationship, multivariate analysis was conducted using logistic regression and the results were reported in odds ratios with its associated p-values and 95% confidence interval.

For the qualitative data, all the in-depth interviews were audio recorded and transcribed verbatim into English and entered into Microsoft word document by trained transcribers. Codebooks modelled around the main topics of the interview guides were created. Codes were then added to the codebook through an iterative process of coding and analysis. The codes were then grouped into preliminary categories of themes. A thematic content analysis was carried out manually through reading and rereading each of the transcript line by line and highlighting and comparing the main themes emerging from the data. The results of the qualitative component of the study were complementary to that of the quantitative study and both were reported in the results segment but were analysed to support the quantitative analysis for triangulation. Quotes were then selected from the transcripts to support the findings reported in chapter 4 and further discussed in chapter five.

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3.10 Ethical Consideration

3.10.1 Ethical clearance

The study followed national and international standards of ethics in research involving human beings. Ethical clearance was sought and obtained from the Ghana Health Service Ethical Review Board. Permission was also sought and obtained from the appropriate authorities of the Agona East District health directorate and traditional leaders.

3.10.2 Informed consent

Consent of the participants was sought before data collection. The purpose of the study, the benefits and rights of the subjects and the procedure involved were explained to all participants. They were assured of confidentiality. This written informed consent was signed or thumb printed by each study participant. Voluntary participation was indicated by signing a consent form.

3.10.3 Risks and Benefits

This was a minimal risk study and did not expose participants to any risks except minor emotional discomfort in answering interview questions were sometimes sensitive in nature. Teenage mothers who participated in this study had the opportunity to be educated on factors related to birth defects and how these risk factors could be avoided in the subsequent pregnancies. Children of respondents were screened and respondents whose children had birth defects were referred to appropriate facilities for required interventions. The results of this study would be useful in policy formulation and implementation that will help prevent birth defects or promote early and adequate interventions for already existing defects in the Agona east district and beyond. This would also enable government and partners to take initiatives to address teenage pregnancy and birth defects as national crisis in infants.

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3.10.4 Privacy and confidentiality

All information provided by the respondents has been kept confidential and data has been locked in a safe place and softcopy has been stored on a hard drive and protected by a password known to only principal investigator and supervisor. Questionnaires and other data collection tools would be destroyed after one year of the study. The name and identity of the respondent was not to be needed for the study. The information provided by each participant was only identified by a code number and treated with strict confidentiality. Respondents' names did not appear or were not mentioned in any part of the report of this study. This research had no risks to the participants apart from feeling uncomfortable about answering some questions due to the sensitive nature of some of these questions.

3.10.5 Voluntary participation

Participants had the right to refuse to answer questions that they were not comfortable with. They also had the right to withdraw from the study at any time they did not feel comfortable to continue. Respondents were not paid for their direct involvement in the research. This was to help avoid coercion and biases in their response.

3.10.6 Data storage and usage

Both quantitative and qualitative data have been stored electronically and in hardcopy. All electronic data including excel spreadsheet, STATA, recordings and transcription have been stored on a computer lock with a unique password known by only the principal investigator and the supervisor. The hardcopies have also been stored safely in a cabinet with a lock and can only be accessed by the principal investigator and supervisor.

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Electronic version of data files was created, used for analysis and now safely secured in softcopy and emails of both Principal investigator and Supervisor. All hard copies of data sheets have been locked in a file cabinet that can only be accessed by the principal investigator and supervisor. Research assistants would be allowed to access them only when they have been given permission by Principal investigator or Supervisor. Data files have been protected for the next five years after which they would be destroyed unless other issues arise to prolong their existence.

3.11 Conflict of interest

I declare I had no conflict of interest in this research.

3.12 Funding

This research is a self-funded project. Funds from basic salary, savings and family support was used to fund project.

3.13 limitation of the study

This study faced challenges in achieving its set objectives just like any other complex and sensitive study of its nature. Some of these are listed below:

- Seventeen teenage mothers who were too shy to be part of the study due to its sensitive nature were excluded from the study. This was done to allow for accurate information gathering and ensuring freewill participation.
- The study could not look at all the possible causes of birth defect into details due to lack of medical technology and other resources needed to do so.

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- The study was carried out in a district with a rehabilitation centre hence some of the participants with children with birth defect were staying in that community for easy access to treatment and not necessarily from the Agona East District.
- During the focused group discussions, it was difficult for some participants to express themselves fully due to the sensitive nature of the discussion.
- Data on birth defect in children of teenage mothers is very scanty despite its rising incidence in Ghana.

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CHAPTER FOUR

RESULTS

4.1 Introduction

This chapter presents the results and main findings of the study. The presentations **were** done according to the key areas and related to the specific objectives of the study. The main characteristics of the teenage pregnant mothers are presented. Subsequently, the various factors that influence childbirth defect including maternal indicators and associated risk factors have been presented.

4.2 Demographic Characteristics of the study

Table 4.2 shows the demographic characteristics of the study participants. A total of 153 children aged 0-2 years and their teenage mothers were selected and included in this study. Majority (n=100; 65.4%) of the children were below 1 year while majority (n=88; 57.5%) were males. The mean age of the teenage mothers was 17.6 (± 1.3SD) while the mean age of the fathers was 24.2 (±3.8SD). More than a third (n=53; 34.6%) of the mothers were aged 19 years. Among the fathers, 47.7% (n=73) were aged 20-24 years. 37.9% (n=58) of the teenage mothers were unemployed while 15.0% (n=23) and 9.8% (n=15) were students and apprentice respectively. Compared to the teenage mothers of children, there were less fathers who were unemployed (n=29; 19.0%), students (n=11; 7.2%) and apprentice (n=8; 5.2%).

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Table 4.2: Socio-demographic characteristics of participants

Variable	Number	Percentage (%)
Age of Child		
0-6 months	63	41.2
7-12 months	37	24.2
1 year +	53	34.6
Sex of Child		
Male	88	57.5
Female	65	42.5
Mother's Age		
15 years	12	7.8
16 years	22	14.4
17 years	37	24.2
18 years	29	19.0
19 years	53	34.6
Occupation of Mother		
Unemployed	58	37.9
Self employed	57	37.3
Student	23	15.0
Apprenticeship	15	9.8
Occupation of Father		
Unemployed	29	19.0
Self Employed	96	62.7
Public Sector	9	5.9
Student	11	7.2
Apprenticeship	8	5.2
Fathers Age		
15-19	11	7.2
20-24	73	47.7
25-29	53	34.6
30+	16	10.5
Total	153	100

4.3 Birth Defect in children and maternal factors

The result of the analysis of the birth defects and maternal factors is presented in Table 4.3. Forty-nine percent (n=75; 49.0%) of the children were either born with some birth defect or have grown to develop some defects. Majority (n = 54; 72.0%) of the birth defects were classified as musculoskeletal defects with only 4.0% (n=3) under respiratory related defects. Some of the

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defects that were reported under the musculoskeletal related defect included difficulty in crawling after 1 year, inability to walk at nearly age 2 years, difficulty turning neck, club foot, right hand deformity, poor foot alignment, etc. More than a third (n= 27; 36.0%) of the childbirth defects were reportedly identified by parents with only 26.7% (n = 20) being identified by medical officers. However, less than half (n = 35; 47.9%) had medical reports to confirm the findings on their children. Notwithstanding, observations done on reported children during the data collection period confirmed various medical reports.

Majority (n = 124; 81.0%) of the teenage mothers had normal vagina delivery with only 5.9% (n=9) having an induced vaginal delivery with majority (n = 137; 89.5%) of these deliveries being conducted in health facilities. On other maternal health services, 7.9% (n=12) of the teenage mothers did not receive any healthcare service through antenatal care while 24.2% (n=37) did not take any folic acid during the first trimester. For those who took the folic acid, 9.5% (n = 11) were taking it irregularly. About 9.2% (n = 14) of the teenage mothers experienced some sort of maternal health problems during pregnancy. Majority (n = 87; 56.9%) of the teenage mothers attempted to abort their children but failed. Among those who attempted to abort their children, 53.2% used over the counter drugs while the remaining used herbal medications. Some of the common drugs that were purchased and used from over the counter included misoprostol, mifepristone, chloramphenicol, etc. Almost half (n = 43; 47.3%) of those who took medication during pregnancy took it during the 2nd Trimester with only 3 (3.3%) taking their medication throughout the lifespan of the pregnancy. More than a quarter of the teenage mothers indicated that during the period while the medication was taken, it was most often done on daily basis.

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Table 4.3: Birth Defect among children and maternal factors

Variable	Number	Percentage (%)
Children with Birth Defect		
No birth defect	78	51.0
Presence of birth defect	75	49.0
Total	153	100
Kind of Birth Defect		
Musculoskeletal	54	72.0
Neurological	18	24.0
Respiratory	3	4.0
Total	75	100
Diagnosed by		
Doctor	20	26.7
Nurses/Birth Attendant	6	8.0
Physiotherapist	13	17.3
Mother/Father	27	36.0
Others	9	12.0
Total	75	100
Medical Report to support		
No hospital record of birth defect diagnosis	39	52.1
Available hospital record	36	47.9
Total	75	100
Delivery Type		
Normal Vaginal Delivery	124	81.0
Caesarean Section	20	13.1
Induced Vaginal Delivery	9	5.9
Total	153	100
Place of Delivery		
Home	16	10.5
Health Facility	137	89.5
Total	153	100
Received Healthcare		
Did not receive any healthcare	12	7.9
Have received healthcare	140	92.1
Total	153	100
Took folic acid during 1st Trimester		
Did not take folic in 1st trimester	37	24.2
Took folic acid in 1st trimester	116	75.8
Total	153	100
How often was tablet taken		
Regular	105	90.5
Irregular	11	9.5

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Total	116	100
Suffer from health problems		
Has no health problem	139	90.8
Suffered from health problem	14	9.2
Total	153	100
Attempted Abortion		
No attempted abortion	66	43.1
Attempted abortion	87	56.9
Total	153	100
Type of Medicine taken		
Herbal	41	46.8
Over the counter drugs	46	53.2
Total	87	100
Period of Pregnancy Medicine was taken		
1st Trimester	46	52.9
2nd Trimester	34	39.1
3rd Trimester	7	8.0
Total	87	100
How often medication was taken		
Daily	25	27.5
Weekly	35	38.4
Monthly	31	34.1
Total	91	100

4.4 Individual Risk Factors of Parents

Other individual risk factors were also analysed. Table 4.4 presents the results of the analysis on other individual factors. Majority (n = 79; 51.6%) of the teenage mothers indicated that they were working in an open environment during the period of the pregnancy while 75.8% (n=116) of the mothers were exposed to some radiation during pregnancy. For those who were exposed to radiation, majority (n = 108; 93.1%) experienced the exposure during the 2nd and 3rd trimester, however, 90.2% (n=105) indicated that they took protective measures regularly. On history of congenital defect in the family, only 6.5% (n=10) of the fathers reported some of their family members have ever had congenital defects. Similarly, only 4 (2.6%) of the fathers indicated they

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had ever been exposed to therapeutic radiation. Majority (n = 122; 79.7%) of the teenage mothers indicated that the fathers of their children were supportive in childcare.

Table 4.4: Individual Risk Factors among the Parents

Variable	Number	Percentage (%)
Working outside during pregnancy		
Does not work during pregnancy	74	48.4
Working outside during pregnancy	79	51.6
Total	153	100
Exposed to radiation during pregnancy		
Not Exposed	37	24.2
Exposed	116	75.8
Total	153	100
Period within which exposure to radiation occurred		
1st Trimester	8	6.9
2nd Trimester	53	45.7
3rd Trimester	55	47.4
Total	116	100
How often were protective measures taken		
Irregular	11	9.8
Regular	105	90.2
Total	116	100
History of Congenital Defect in Father's Family		
No history of congenital defect	126	82.4
Congenital defect	10	6.5
Don't Know	17	11.1
Total	153	100
Father's Exposure to Therapeutic Radiation		
Father had no exposure to radiation	127	83.0
Father exposed to radiation	4	2.6
Don't Know	22	14.4
Total	153	100
Is Father Supportive		
Father is not supportive	31	20.3
Father is supportive	122	79.7
Total	153	100

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4.5 Teenage Pregnancy Experience and Perception and Awareness of Teenage Mothers on Birth Defect

A qualitative analysis was conducted to ascertain teenage mothers' perception and general understanding of birth defect among children. Through focus group discussions, teenage mothers expressed diverse opinions on birth defects and discussed some of the challenges they faced during and after their pregnancies. A total of five different focus group discussions and three key informant interviews were conducted.

The first part of the discussions centred on the teenage pregnancy experience and its related challenges. The discussions clearly showed that teenage mothers go through a lot of challenges during the period of pregnancy. While some go through stigma and discrimination challenges, others are denied the needed care during pregnancy. In some of the discussions, some of teenage mothers were quoted as saying:

> *Friends and family became very angry at me for getting pregnant while I was in school. I became very ashamed when I realized I was pregnant. I even thought of aborting the pregnancy. I took herbal medicine to abort the baby due to the stigma I was going through. I tried but the pregnancy couldn't be terminated so I decided to keep it. After the pregnancy could not be aborted, I started attending antenatal clinic (A Teenage Mother, FGD 3)*

Another person, who also had similar challenges, indicated that:

> *My understanding of teenage pregnancy is when a girl gives birth at an early age. I had a very bad experience as people were mocking me and this made me very uncomfortable. I felt bad but had no option than to keep the pregnancy. Even though it came to my mind to*

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abort the baby I had a second thought and decided not to do it (A Teenage Mother, FGD 5).

Teenage pregnancy periods are not glorified as has been the case with married couples whose pregnancies are more of a blessing and comes with celebration in most cases. The stigma and shame associated with teenage pregnancy drove some teenagers to attempt abortion when they found out they were pregnant**.** This has its own implication on birth defect. A teenage mother's experience:

When I realised I was pregnant, I tried taking any medicine that I saw 'not for pregnant women' written on it, in the hope that it would help my pregnancy to go away. I could not bear the shame and stigma that was awaiting me. I tried hard to terminate the pregnancy but was not successful so I decided to keep it and give birth rather. (Teenage mother, FGD 3).

Another teenage mother also experienced a similar thing;

During my pregnancy, I was advised by my peers to jump from a height in order to terminate the pregnancy. I went on a hill and jumped down but I sustained serious injuries to my leg and other parts of my body but the pregnancy didn't terminate so I had to keep it and give birth. (Teenage Mother, FGD 2).

In the discussions another teenage mother cleared the air on an important issue where some recommended abortion pills may have been used improperly, poorly stored or probably expired at the time they were administered;

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> *When I got pregnant, I told a friend who gave me Cytotec to take. I took the drug and a little blood came from my private part but this stopped after a few minutes. Later, the pregnancy couldn't be terminated and I had to give birth. (Teenage Mother, FGD 3)*

However, not all teenage pregnant women suffered shame and stigma during the period. Others were gladly accepted by the families of both the girl and the boy. This happened most especially when the girls are more than 16 years and are not in school or apprenticeship programme. Some of the teenage mothers indicated that the family of their counterparts were very supportive during the lifespan of the pregnancy. One teenage mother confirmed this by saying:

> *The man accepted the pregnancy and is very supportive in all aspects. Both families have been supportive as well. The health care provider prepared a dorsal splint to be used and also does exercise for my child to be strong and to walk well. I can even see some improvement in my child's condition (Teenage mother, FGD 1).*

Notwithstanding, the effect of the pregnancy on the education and career development of most teenage mothers was mostly negative. These are a few of their opinions:

> *When I became pregnant, because of the shame and the level of stigma I experienced from friends and family members, I decided to stop school. I had only a year to complete but I could not complete my Basic Education. I couldn't go back after delivery. I have been a drop-out since 2019 (A Teenage Mother, FGD 1).*

> *I delivered through CS at the Swedru Government Hospital on the 10th month of my pregnancy. My child weighed 2.7kg and was born with structural anomaly of poor neck*

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control which the doctor said was because of cerebral palsy. However, taking care of my sick child is really affecting my goals of completing my fashion designer training (A teenage mother, FGD 3)

I had a terrible experience. When I became pregnant, my crafts madam decided to sack me from the workplace. Though initially thought I could finish the apprenticeship training, because of stigma in the workplace, I decided not to go there again. I have not been able to continue after my delivery even though my child is more than a year now. I cannot continue the training because of my child's condition now (A Teenage Mother, FGD 3).

For five teenage mothers in different focus group discussions, though the pregnancy affected their career development at the time, they were able to complete their trainings or education after delivery. One mother said:

Even though I loved going to class every day, I could not bear the shame attached to the pregnancy, so I decided to stay home. Fortunately for me, the WASSCE exams was postponed and rescheduled to another date. I decided to learn at home and join my colleagues to write the exams which I did. I am hoping to further my education to the tertiary level. (Teenage Mother, FGD 2)

The shame and stigma that results from teenage pregnancy usually led to some of these poor girls to decide on aborting the foetus, disregarding the dangers that are associated with it. To some, their decision not to abort the foetus was because of the fear of death. However, knowledge on birth defect should the abortion fail was not in their minds. They had no knowledge of what birth defects are, even though some confirmed having seen children with some birth defects before

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experiencing. They never thought that a failed abortion can also cause birth defect or harm their babies.

To some of the participants, birth defect in children may have a spiritual cause while others assume it to be God's will. Others also believed that birth defect could be genetic, inferring from a similar experience in either the mother's family or father's family. In one of the FGD, a teenage mother mentioned that:

> *There is one person in my husband's family with stiff neck and he is not able to turn it. When I saw my child's condition, I automatically concluded that he has picked some of the genes of my in-law. (Teenage Mother, FGD 4)*

Another teenage mother had a different perspective. She felt that the birth defect with her child (unable to sit even 11 months) was caused by her husband's family.

> *When I gave birth, I used to stay with my husband's family. They were very supportive though. Unfortunately, one of my in-laws decided to make my baby sit when she was only two months. I think that is what affected the girl not to be able to sit again. (Teenage mother, FGD 3)*

Despite the limited knowledge on birth defect among the participants of the FGDs, there were some responses from some of the participants that showed some level of understanding of birth defect. Some of their views included:

> *I understand birth defect as a child born with a mistake, but I don't know the cause of such defects. The physiotherapist explained that my child has a condition called flat foot (Teenage Mother, FG 5).*

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I don't have much idea about birth defect but I was told my child has poor trunk control which is a sign of cerebral palsy. I have no idea about the cause of a birth defect (Teenage Mother, FG 1).

I don't know much about birth defect but I have seen children and people who can't use their body well due to a problem. My child seems to be partially paralyzed in both upper and lower arms. The doctor explained that my child has a birth defect which has resulted in her inability to use upper and lower limbs. She was referred to the Salvation Army rehab centre for intervention. I don't know what causes these problems in their bodies but I think falling sick and taking many drugs during my pregnancy may have affected my baby (Teenage Mother, FG 2).

4.6 Socio-demographic characteristics and childbirth defect

Regression analysis was conducted to test the level of association that exist between demographic characteristics and birth defect. The result of the analysis is presented in Table 4.4. The results of the analysis showed that the age of the child, the age of the mother, mothers' occupation and father's age were significantly associated with birth defect. Among the children 7-12 months old, 21 (56.8%) of them had birth defect while 30 (56.6%) of the children more than 1 year had birth defect. The difference in the results of the birth defect in the age of the children was statistically significant ($\chi = 4.15$; p-value = 0.042). On mothers age, the proportion of children with birth defect increases with an increase in age of the mothers. Teenage mothers age 17 years had 15 (40.5%) of their children having birth defect while mothers aged 19 years had 33 (62.3%) of their children having birth defect. The difference in birth defect among the mothers' age was statistically significant ($\chi = 9.38$; p-value = 0.003). Majority (n = 19; 82.6%) of the mothers who are students

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have their children with birth defect while 7 (46.7%) of the children born to teenage mothers who are apprentice have birth defect. The difference in birth defect status among mothers' occupational status was statistically significant (χ = 11.06; p-value = 0.001).

As was the case of mothers, an increase in the age of the father increases the proportion of children with birth defect. Fathers age 25-29 years had 30 (61.2%) of their children having birth defect while 8 (61.5%) of the children born to fathers age 30+ years had birth defect. The difference in the birth defect among the age of the fathers was statistically significant (χ = 9.95; p-value = 0.003).

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Table 4.4: Relationship Between Socio-Demogrpahic Characteristics and Birth Defect

Variable	Birth Defect Status		
	Positive n (% row)	Chi-square	p-value
Age of Child		4.15	0.042
0-6 months	24 (38.1)		
7-12 months	21 (56.8)		
1 year +	30 (56.6)		
Sex of Child		0.00	0.964
Male	43 (48.9)		
Female	32 (49.2)		
Mother's Age		9.38	0.003
15 years	3 (25.0)		
16 years	8 (36.4)		
17 years	15 (40.5)		
18 years	16 (55.2)		
19 years	33 (62.3)		
Occupation of Mother		11.06	0.001
Unemployed	16 (27.6)		
Self employed	33 (57.9)		
Student	19 (82.6)		
Apprenticeship	7 (46.7)		
Occupation of Father		2.58	0.116
Unemployed	18 (62.1)		
Self Employed	44 (45.8)		
Public Sector	7 (77.8)		
Student	4 (36.4)		
Apprenticeship	2 (25.0)		
Fathers Age		9.95	0.003
15-19	-		
20-24	26 (40.6)		
25-29	30 (61.2)		
30+	8 (61.5)		

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4.7 Maternal health factors and birth defect

Another analysis was conducted to test the level of association between maternal health factors and birth defect. The result of the analysis as presented in Table 4.5 show that only two factors/variables (attempted abortion and the type of medicine taking during pregnancy for attempted abortion) were significantly associated with birth defect in children. For teenage mothers who attempted to have abortion, majority (n = 50; 57.5%) gave birth to children with birth defect and this was statistically significant ($\chi = 5.81$; p-value = 0.017). Additionally, the type of medicine taken was significantly associated with birth defect ($\chi = 5.20$; p-value = 0.027).

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Table 4.5: Relationship between maternal health factors and child birth defect

Variable	Birth Defect Status		
	Positive n (% row)	Chi-square	p-value
Delivery Type		3.56	0.069
Normal Vaginal Delivery	54(43.5)		
Caesarean Section	17(85.0)		
Induced Vaginal Delivery	4(44.4)		
Place of Delivery		4.31	0.052
Home	4(25.0)		
Health Facility	71(51.8)		
Received Healthcare		3.57	0.078
Did not receive healthcare	9(75.0)		
Received healthcare	66(47.1)		
Took folic acid during 1st Trimester		2.46	0.121
Did not take folic acid	14(37.8)		
Took folic acid	61(52.6)		
How often was tablet taken		0.25	0.620
Regular	56(53.3)		
Irregular	5(45.5)		
Suffer from health problems		1.11	0.302
Did not suffer from health problems	70(50.4)		
Suffered from health problems	5(35.7)		
Attempted Abortion during pregnancy		5.81	0.017
No abortion attempt during pregnancy	25(37.9)		
Attempted abortion during pregnancy	50(57.5)		
Type of Medicine taken		5.20	0.027
Over the counter drug	30(65.2)		
Herbal	24(58.5)		
Period of Pregnancy Medicine was taken		0.73	0.395
1st Trimester	21(45.7)		
2nd Trimester	23(67.6)		
3rd Trimester	3(42.9)		
How often medication was taken		3.29	0.074
Daily	10(40.0)		
Weekly	20(57.1)		
Monthly	20(64.5)		

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4.8 Individual risk factors characteristics and childbirth defect

Another bivariate analysis was conducted to test the relationship that exist between individual risk factors and birth defect. The analysis (as shown in Table 4.6) showed that all other variables did not have relationship with birth defect except exposure to radiation during pregnancy. Proportionately, more than half (n = 67; 57.8%) of the teenage mothers who were exposed to radiation had their children having birth defect. However, only 8 (21.6%) of the teenage mothers who did have any exposure to radiation had their children developing some birth defect. The difference in the birth defect among the teenage mothers who were exposed to radiation was statistically significant (χ = 15.4; 0.000).

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Table 4.6: Relationship between individual risk factors and child birth defect

Variable	Birth Defect Status		
	Positive	Chi-square	p-value
	n (% row)		
Working outside during pregnancy		2.92	0.089
Did not work outside during pregnancy	31(41.9)		
Worked outside during pregnancy	44(55.7)		
Exposed to radiation during pregnancy		15.4	0.000
Not Exposed	8(21.6)		
Exposed	67(57.8)		
Period within which exposure to radiation occurred		0.32	0.572
1st Trimester	5(62.5)		
2nd Trimester	28(52.8)		
3rd Trimester	34(61.8)		
How often were protective measures taken		2.91	0.099
Irregular	4(33.3)		
Regular	65(59.1)		
History of Congenital Defect in Father's Family		1.29	0.262
No history of congenital defect in father's family	65(51.6)		
Presence of congenital defects in father's family	3(30.0)		
Don't Know	7(41.2)		
Father's Exposure to Therapeutic Radiation		0.12	0.727
Father not exposed to radiation	63(49.6)		
Father exposed to radiation	2(50.0)		
Don't Know	10(45.4)		
Is Father Supportive		0.10	0.746
Father is not supportive	16(51.6)		
Father is supportive	59(48.4)		

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4.9 Factors sociated with birth defect among children.

After the first level of analysis, all significant factors were further inputed into the second level model to further test the strength of the association. The results of the multivariate analysis is presented in Table 4.7. After controlling for all significant factors, only three factors were significantly associated with birth defect among the children. Teenage mothers who attempted to abort their pregnancies but failed were 5.8 more likely to give birth to children with birth defect as compared to teenage mothers who did not attempt to abort their pregnancies (AOR: 5.8; CI: 2.98 – 9.36). Children whose teenage mothers took chloramphenicol during pregnany have 4.42 chances of developing birth defect as compared to children whose mothers took herbal medicine during pregnancy (AOR: 4.42; CI: 1.24-15.73). Again, children whose teenage mothers were exposed to radiation during pregnancy, irrespective of the period the exposure occurred, were 4.34 times more likely to have birth defect as compared to children whose teenage mothers did not experience exposure during the pregnancy life span (AOR: 4.34; CI: 1.03-18.24).

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Table 4.7: Multivariate Analysis of factors associated with Childbirth Defect

Characteristics	Adjusted Odds Ratio	Confidence Interval (95%)	p-value
Age of Child			
0-6 months	1		
7-12 months	0.21	0.02-1.97	0.175
1 year +	0.84	0.13-5.41	0.858
Mother's Age			
15 years	1		
16 years	0.08	0.07-0.99	0.050
17 years	1.09	0.12-10.05	0.935
18 years	5.00	0.58-42.70	0.141
19 years	-		
Occupation of Mother			
Unemployed	1		
Self employed	1.16	0.22-5.95	0.860
Student	5.34	0.68-41.57	0.109
Apprenticeship	0.42	0.06-2.68	0.357
Fathers Age			
15-19	1		
20-24	0.28	0.00-16.63	0.544
25-29	4.13	0.06-29.46	0.515
30+	-	-	-
Attempted Abortion			
No attempted abortion	1		
Attempted abortion	5.8	2.98 – 9.36	0.035
Type of Medicine taken			
Herbal	1		
Over the counter drugs	4.42	1.24-15.73	0.022
Exposed to radiation during pregnancy			
Not Exposed	1		
Exposed	4.34	1.03-18.24	0.045
Place of Delivery			
Home	1		
Health Facility	3.01	0.44-20.66	0.262

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4.10 Summary of the chapter

The chapter has presented the main findings of the study, situating it within the context of the outlined objectives of this study. Each of the objectives, detail analysis was done to derive the needed results. The results have been presented in table forms and other qualitative analysis and results presented in quotes.

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CHAPTER FIVE

DISCUSSION

5.1 Introduction

This chapter outlines the main findings of the study and examines these findings within the context of the study objectives. The main findings as presented in Chapter Four is summarised in this chapter. The summary is then compared with literature from different studies to ascertain whether the results obtained in this study conforms to other literature or presents a totally different opinion.

5.2 Demographic Characteristics and their Association with Birth Defect

The study observed a higher proportion of birth defects (49.0%) among the children born to teenage mothers. The concentration of the study among teenage girls and within a zone where birth defect was prominent relatively resulted in a higher birth defect prevalence as compared to other studies. In most cases, prevalence had ranged between 2% to 10%. For instance, Adane et al., (2020) in a systematic review of different studies across sub-Saharan Africa observed a pooled prevalence of 2.04%. Ive et al., (2011) also in a study among pregnant women in general observed a lower birth defect prevalence of 2.0%. In all these studies, the focus was on general mothers, irrespective of their age. However, when similar studies were conducted by Feldkamp et al., (2017) with much focus on adolescent mothers (of which nearly 65% were teenagers), the prevalence was relatively higher at 20.2%, far higher than the other rates. Depending on the area and the focus of the study, the prevalence of birth defect may differ. The study observed that among the children with birth defects, 72% are musculoskeletal. This finding corroborates with series of studies that have been conducted on birth defect. The study by Adane et al., (2020) on birth defects in sub-Saharan Africa observed that the commonest type of birth defect in the systematic reviews of

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several studies was musculoskeletal type. Again, Lancaster, (2011) and Khandekar & Jaffer, (2010) all observed similar findings in their studies. Contrary to these results was a finding observed by Ive et al., (2011) in a study in Brazil which observed that the most common types of birth defects were isolated congenital heart disease and down syndrome.

The study observed that demographic factors such as age of the child, the age of the mother, mothers' occupation and father's age were significantly associated with birth defect. With children's age, it was observed that the risk of birth defect increases as the child grows from the day of birth. On mothers age, the proportion of children with birth defect increases with an increase in age of the mothers. As was the case of mothers, an increase in the age of the father increases the proportion of children with birth defect. A study by Khandekar & Jaffer, (2010) contradicts the results observed in this study. Khandekar & Jaffer, (2010) observed no significant relationship between birth defect and paternal and maternal age. However, Ive et al., (2011) in the study in Brazil corroborates the finding in this study where they observed a significant relationship between maternal and paternal age and birth defect. When further analysis was done to test the strength of the relationship, maternal and paternal ages did not have any association with birth defect. Yang et al., (2014) also confirms the findings in this study through their study where they established strong relationship with paternal age and birth defects. In their study, it was observed that an advanced age of the father increases the risk of birth defects in children. It is believed that when there is an accumulated chromosomal aberrations and mutation during male germ cell maturation, there is accumulated risk of the male developing cells that may have effect on their paternity children.

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5.3 Maternal Health and Individual Risk factors Associated with birth defect

Beyond the demographic factors that influenced the prevalence of birth defect, maternal and other risk factors showed some level of significance with birth defects. The risk of birth defect in children increases with an increase in unsafe abortion. There is higher risk of teenage of teenage mothers giving birth to children with birth defect when they attempted to abort their children during pregnancy. Significantly, the risk of birth defect increases when over the counter drugs are used in an attempt to abort the pregnancy. Teenage mothers who took medicines like chloramphenicol, misoprostol, mifepristone, etc had about 4 times higher the risk of birth defect as compared to those who didn't take any drug or took only herbal medicine. Findings from the study by Adane et al., (2020) confirms this result. In their study, Adane et al., (2020) observed that pregnant women who took chloramphenicol and other non-approved drugs have 14.6 times chances of giving birth to children with some level of defect as compared to those who only use folic acid. Lancaster, (2011) also maintained that women who frequently used therapeutic drugs without the approval of their medical doctors have higher propensity of giving birth to children with different forms of defects. Taking drugs or medicine rather than what has been prescribed by medical doctors has gross implication for the development of the foetus and the mother's survival.

Adamecz-völgyi et al., (2017) noted that as unsafe abortion increases, the number of children born with defect increases among teenage mothers. In other studies, it was established that failed abortion has consequential effect on the health status of the child (Atakro et al., 2019; Mukhopadhyay et al., 2010). Fonseca et al. (1993) in a detail analysis explains that one of the most common birth defects on children after failed abortion is congenital malformation of the scalp and

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cranium of the child. In all studies, there is that link that exists between increases use of over-the-counter drugs or abortion drugs and birth defect.

The study did not find significant association between herbal medicine taken during pregnancy and birth defect. However, different studies have observed contrary findings from this. For instance, Laelago, (2018) in a study on the benefits and effects of the usage of herbal medicine during pregnancy observed that when pregnant women took consistently herbal medicine without knowing the use and its impact, they tend to impact on the growth of the foetus and ends up giving birth to children with defects.

Another significant observation that this study made was the strong association that exist between exposure to radiations and birth defects. Proportionately, more than half of the teenage mothers who were exposed to radiation had their children having birth defect. On the other hand, only one-fifth of the teenage mothers who did not have any exposure to radiation had their children developing some birth defect. Children whose teenage mothers were exposed to radiation during pregnancy, irrespective of the period the exposure occurred, are 4.34 times more likley to have birth defect as compared to children whose teenage mothers did not experience exposure during. the pregnancy life span. Exposure to radiation had over the years have impact on the health status of workers who are exposed to this. The type of radiation one is exposed to is critical at any point in time. The study by Brusselen et al., (2020) corroborate the findings in this study. In their study, Brusselen et al., (2020) noted that pregnant women who were exposed to hazards and some radiations in a copper industry have higher risk of having children with defects as compared to those who stayed in-door and did not experience any exposure. Ive et al., (2011) in their study in Brazil also observed that women who had some exposure to teratogenic agents during pregnancy

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had higher risk of giving birth to children with some defects. Lancaster, (2011) also in a study reiterated the point that exposure to environmental conditions, whether in the form of radiation or to other form of hazard, has the potential of increasing the risk of birth defect. Lancaster (2011) made this assertion after observing that the odds of mothers who had environmental exposure during pregnancy was 3.5 times higher than those who did not have any exposure. It is therefore important to acknowledge the effects of radiation to the growth of the foetus during pregnancy.

5.4 Teenage Pregnancy Experience and Perception about Birth Defect

Teenage mothers reported that they suffered some level of stigma and humiliation during the period of their pregnancy. The shame associated with the pregnancy sometimes pushed some of the teenage pregnant mothers to commit abortion by applying different medications. All the teenage mothers who attempted abortion admitted they tried it with unapproved means. They were too scared to go to the hospital or open up to their parents.

To some extent, some of the teenage mothers had to stop school and apprenticeship programmes for fear of mockery and maltreatment. Pérez et al., (2017) indicated that in poor communities in Ghana and other countries within the sub-region, teenage mothers are challenged with a number of issues including maltreatment while at the same time, disadvantaged with poor maternal conditions. Due to shame, some of these girls do not attend antenatal care services which is a platform to improve maternal health. Mukhopadhyay et al., 2010 in a study mentioned that because of shame and stigma, and different levels of stigma, teenage pregnant mothers initiate antenatal services very late and missed out the WHO required 4+ visits and folic acid intake. The study

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concluded that teenage mothers were less careful about their pregnancy, not only because of the stigma, but also the lack of awareness and maturity.

Knowledge and awarenss generally among the teenage mothers on birth defect was low. Most teenage mothers seem not to have any idea about the causes of birth defects in children. Some perceived these birth defects as having a spiritual root cause while others perceive birth defect as having some spiritual connotation or involvement. The limited level of knowledge and awareness on birth defect continues to fuel individual's perception about children's birth defect conditions. Series of studies have observed contrary findings on knowledge about birth defect. Bello et al., (2013) in a study among pregnant women to assess their knowledge on birth defect observed that nearly half of the pregnant women had high knowledge about birth defect while nearly half had average knowledge about birth defect. Again, Silva et al., (2019) in a different study among nursing mothers in Sri Lanka noted that mothers have adequate knowledge about birth defect including the causes and its consequences. The study which was done among 350 antenatal women attendants observed significant increase among women who have had at least 4+ ANC visits. Among nursing mothers who were less than 20 years (teenagers), the study further observed significant increase in knowledge on birth defect, a result which is in contrast to the findings to the result of this study. It is possible that the low knowledge about the causes of birth defect is due to lower level of education or exposure among participants in the rural areas.

5.5 Summary of the Chapter

The chapter discussed the main findings of the study and compared the results with other studies. Additionally, the chapter discussed the reasons behind some of the key findings and aligned them

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along the context of health care service in the country. Attempted abortion and exposure to radiation were found to be significant risk factors of birth defect in children of teenage mothers. As much as the literature agreed with this, it also acknowledges that other factors such as socioeconomic factors, nutritional factors and health system factors are still important factors associated with birth defect in children of all age groups. Low knowledge of teenage mothers about the risk factors and dynamics of health and birth defects is also a significant public health concern.

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CHAPTER SIX

CONCLUSION AND RECOMMENDATION

6.1 Introduction

The chapter presents a summary of the study and through that, makes a conclusion from the study. The conclusion is linked to the main objective of the study. Additionally, a set of recommendations are proposed for consideration by different stakeholders. The recommendations are inferred from the findings of the study.

6.2 Conclusion

The study findings suggests that attempted abortion and exposure to radiation were the most significant factors that influence birth defect in the population studied. However, other factors such as socioeconomic status, health system factors, maternal factors were contributing factors identified in some of the cases.

The study further shows the risk involved in attempting abortion without success and exposure to other risk factors of birth defect which teenagers are exposed to. This information therefore provides guide for development of interventions that seeks to address challenges of musculoskeletal birth defect.

Irrespective of the age, uptake of unapproved medication is not healthy for the development and growth of the foetus but the desire and probability of the teenage girl to consume these has been found to be relatively higher than their counterparts who are older and more ready for childbearing.

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Cultural and religious belief system continues to push innocent young girls to attempt to practice unsafe abortion. Until our cultural system changes and improves to embrace and counsel teenage girls who get pregnant, it may be difficult to reduce the rate at which young girls patronise unsafe abortion. For fear of shame and discontinuation of school/education, the young girl may attempt to abort the baby and if this fails, she may tend to hate the innocent child let alone a child who sustains a birth defect in the process. It is therefore important to increase the support system in our communities to reduce the risk of young girls committing unsafe abortion.

Also, according to the literature examined for this study, poor nutrition of both mother and child, presence of disease or infection in early childhood and exposure to harmful chemicals have all been identified as serious contributing factors to birth defect despite participants in this study did not significantly report such possibly due to lack of knowledge of such.

Similarly, exposure to radiation, irrespective of the status of the pregnancy and maternal age, it can be dangerous to the health of the foetus. Radiation, irrespective of the form it may take, has its own consequences. Even though this study did not find out whether the exposure to radiation was solely at the health facility during ANC sessions, it may be important to look at the methods that are used for scanning at the health facilities. Some are obsolete and may pose a lot of threat to pregnant mother and her unborn baby.

Another deduction that has been made from this study is the limited knowledge of teenage mothers about birth defect. The low level of knowledge and awareness may generally be as a result of the low education generally in Ghana about birth defect. This would continue to hide the plight of such vulnerable groups and continue to affect the lives of citizens if nothing is done to intervene.

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Education on proper handling of infants is also important as it is also possible that poor handling could cause injuries and possibly lead to a defect in the fragile baby.

The prevalence of birth defect observed in this study is an outlier which requires urgent attention. It has been explained earlier that the study targets and the samples that were selected were skewed towards communities where birth defects were visibly present. It can therefore be concluded that with general assessment or study in the region, prevalence may be relatively different. Moreover, the prevalence of birth defect may be high generally in the country if extensive study across the country should be conducted. Predominantly, almost all the birth defect cases that were recoded were musculoskeletal and neurologic types which is very common in the country.

6.3 Recommendation

The following recommendations are proposed for consideration based on the findings from this study:

6.3.1 Health policy level

1. Ghana health service should strengthen primary health care in order to address the health needs of adolescent girls to enlighten them on the disruptive effects of unapproved abortion.
2. The study observed that knowledge on the effects of attempted abortion was limited. The government should therefore come up with interventions that targets the youth on the effects of abortion to both the mother and the baby.

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3. Ministry of health, GHS and health NGOs such as UNFPA, Marie Stoppes and Icon health system should also promote legal abortion and penalize quacks who practice illegal abortion by fishing them out and handing them over to face the wrath of the law.

6.3.2 Health Service Level

1. District Health Administration in Agona East should develop training modules for all health frontline health workers especially Community Health Nurses and Midwives on birth defects in order to equip them to provide adequate information and education on birth defect prevention.
2. Community Health Nurses and Midwives should start incorporating birth defect education into their routine awareness education during antenatal and child welfare clinics (ANCs and CWCs). This will enhance knowledge among pregnant women and nursing mothers to take precautions especially during pregnancy. During community durbars and home visits, healthcare providers can integrate birth defect awareness into their programmes.
3. Health facilities should ensure that special care is given to children with birth defect as a measure of addressing the challenge of increasing incidence of birth defect in the district.
4. As part ANC services, Ghana health service and its health workers should ensure that pregnant women are given adequate protection before any scan is taken to limit the impact of the radiation on the foetus

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6.3.3 Community level

1. Community health system through the Community Health Management committee and health volunteers should be strengthened to facilitate awareness on birth defects and ensure that teenage pregnant mothers are not discriminated against but are rather supported to access maternal healthcare immediately they are identified. This would help to reduce teenagers from attempting abortion illegally.
2. The opinion leaders, traditional leaders and religious leaders should engage community members to help curb the escalating incidence of teenage pregnancy and birth defects through promotion of good reproductive habits.
3. Schools, training centres and youth movement groups in the district should be engaged in the agenda of preventing teenage pregnancy and birth defects through education and awareness creation.
4. Family heads and parents should be empowered and enlightened to take precautionary measures in the reproductive education of their youngsters in order to reduce untimely pregnancies and if pregnancies should occur, they would be able to monitor and prevent the consumption of harmful substances.
5. The district assembly common fund should be allocated to support teenage mothers especially those who have children with birth defects.

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APPENDICES

7.1 Questionnaire

Questionnaire for screening new-borns for congenital birth defects

Name of new-born		NOTES
NEWBORN BACKGROUND		
Alive	1	
Dead	2	
Does your child have any type of birth defect or congenital anomaly?	Yes No DK	
What kind of birth defect is present in the child?		
Who diagnosed or detected the case?	Doctor..... Nurse/birth attendant…….. Mother /Father…… Relative/friends……. Others…….	

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Is there any document or Medical report to support Diagnosis?	Yes …… No……..	
What was the type of delivery for (name)?	NVD---------- C/S ---------- Induced vaginal delivery------	
Where was (name) born?	Home- ---------- Public Hospital ---------- Private Hospital ---------- PHCC ---- Others (specify)…….	
During your pregnancy by (name), did you receive health Care?	Yes ---------- No ---------- DK ----------	
During the first trimester of Your pregnancy in (name), Did you take folic acid tablets?	Yes..... No ---------- DK ----------	
How did you take those tablets?	Regularly (daily)…… Irregularly……	

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	DK……	
During your pregnancy (name) did you suffer from any of the following health problems? Probe and circle the answers	Rubella……. Toxoplasmosis…… Chicken pox…… Syphilis…… Diabetic Mellitus…… Hypothyroidism……. Others (specify)…… Didn't suffer	
During your pregnancy (name), did you take any medicine(s)?	Yes..... No..... Don't remember.....	
What was/were the type of Medicine(s) Probe and circle the answers	Epanutin..... Anti-carcinogenic drugs..... Steroid..... Chloramphenicol..... Others(specify)_____	

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	DK The drug.....	
Is it possible to see the Medicine(s) packet?(if Available)	Yes ---------- No ----------	
In which period of your Pregnancy did you take That/those medicine(s)?	1st trimester…… 2nd trimester…… 3rd trimester……. Whole pregnancy period…….	
For how long did you take That/those medicine(s) during Your pregnancy?	Days……. Weeks……. Months…… DK……	
Where were you living During the 1st trimester of Your pregnancy in (name)?	Same area……. Other area……. Mention: Region_____ District _____	

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Beside your work at home, were you working outside home when you were pregnancy with (name)?	Yes…… No……	
What was your occupation? & What work do you do now?		
RADIATION EXPOSURE MODULE		
During your pregnancy in (name), were you exposed to Any kind of radiation?	Diagnostic radiation…… Therapeutic radiation…….. Not exposed…….	
In which month of pregnancy Did you expose to the Radiation?	Month……. DK……	
Were suitable protective Measures taken by the care Provider?	Yes…… No…… DK……..	
ABOUT THE FATHER OF CHILD		
On what month and year was the (name's) father born?	Month Don't know the month--------- Year Don't know the year----------	
Is the father still alive?	Yes No (year of death……)	
How old is the father?	Age in years	
How old was the father when he died?	Age in years	

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Before your pregnancy in (name), what was his Father's occupation?	Father's occupation……..	
Did (name's) father or any Member of his family have Congenital birth defects? (health status and compatibility of partners)	Yes…… No…… DK……..	
Specify the relationship to the father (Circle the choices)	The father himself…… His father /mother……. Brothers/sisters……. Children of brothers/sisters…. Uncles/aunts..... Cousins…….. Others (specify)…….	
Is/was there any relationship between you and (name's) father?	Cousins… Other relation…… No relation……	
Before your pregnancy in (name), was his father exposed to any therapeutic radiation? Or does the father have any medical conditions?	Yes…… No…… DK…….	
Is the father of (name) supportive?	Yes……. No…….. DK…….	

Questionnaire adapted from child health questionnaire, India

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7.2 GUIDE FOR IN-DEPTH-INTERVIEWS

RESEARCH TOPIC: FACTORS ASSOCIATED WITH BIRTH DEFECTS AMONG CHILDREN OF TEENAGE MOTHERS

INTRODUCTIONS

Could you please tell me about yourself and your family?

SECTION A: EXPERIENCES WITH TEENAGE PREGNANCY

1. What were your experiences with teenage pregnancy?
2. What is your opinion about teenage pregnancy?
3. How did you feel when you realized you were pregnant?
4. What actions did you take to avoid the pregnancy from developing?
5. How often did you attend antennal clinics?
6. During your pregnancy (name) did you suffer from any health problems?
    a. Probe (please tell me more about those health problems)
7. How did the pregnancy affect your life (probe for school, work)

SECTION B: EXPERIENCES DURING DELIVERY

1. What was your experience during the labour of (name)?
2. Was there any complications during the delivery?
    a. Probe

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3. How was your baby when you delivered?
    a. Probe: birthweight, cried at birth, head circumference,
    b. Health status of baby: structural anomaly, injury, infection,
4. How did the healthcare provider react when you delivered the baby?

SECTION C: KNOWLEDGE OF BIRTH DEFECTS

1. What do you understand about birth defects?
    a. Probe type of birth defects: (can you tell me some of the birth defects you know?)
2. What type of birth defect does your child have? Probe
3. What information did the healthcare provider give you concerning your child's condition?
4. What do you think causes birth defects?

SECTION D: FACTORS ASSOCIATED WITH BIRTH DEFECTS?

1. Do you have any habits or lifestyles that you think could cause harm to yourself or your baby?
    a. Probe (smoking, alcohol, drugs)
2. What do you think could have caused the birth defect in your child?
3. Did you deliver at home or hospital?
    a. How was your experience?
    b. Were there any challenges?
4. Did you take any medications, herbal preparations or substance to get rid of the pregnancy?
5. Did you try to do anything else to terminate the pregnancy?
6. What medications or supplements did you take to protect the pregnancy and the baby?
    a. Probe: folic acid, iron supplements
7. How was your feeding during the pregnancy and after delivery?

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8. How was the nutrition of your child during the first 10 weeks of birth?

SECTION D: SOCIOECONOMIC SUPPORT

1. How did the man responsible for the pregnancy behave towards you when you disclosed to him that you were pregnant?
    a. Probe: Denial or supportive partner?
    b. Support from man: financial, emotional, security
    c. Is his support sufficient for you and your child or children
2. Did you have any problems with your source of feeding during pregnancy and after delivery?
3. What support is your family and community offering you to be able to cater for the needs of you and your child or children?
4. What supports or interventions did your healthcare provider offer you concerning your child's condition?
5. Do you have any other comments or questions?

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7.3 Participant information sheet for guardians of teenage mothers less than 18 years

Project Title: **Factors associated with birth defects in children of teenage mothers in the Agona East District in the Central Region**

Introduction

I am **Nelson Ahadome**, a master's student of the School of Public Health, University of Ghana, Legon. I am here with my research assistants to carry out a study to find factors associated with birth defects in children of teenage mothers. Specific study sites for this project includes communities in the Agona East District. This is purely for research purposes and forms part of a requirement for an MPH degree in the School of Public Health University of Ghana. Your teenage girl and her child are being selected for this study because they have the element of interest for conducting this research.

Nature of study

This an exploratory study under social and health sciences aimed at bridging the knowledge-gap about birth defects in children of teenage mothers.

Procedure

The study will involve participants answering simple questions about the history surrounding their health and that of their children before, during, and after pregnancy. Consent of the

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guardians of teenage mothers below 18 years will be sought and assent forms will be signed by such teenagers. Emancipated teenage mothers and teenage mothers 18 years and above will be allowed to sign just consent forms. Children of participants will be screened for birth defects. This study will last for a period of seven months (including data analysis) but the interviews will only last for an hour per participant. The information the teenage mother provides will add to knowledge about factors associated with birth defects in teenage pregnancy.

Potential Benefits and Risks

Participants who will participate in the study will have the opportunity to be educated on the importance of preventing birth defects and identifying them for early intervention. Also, respondents who will need special attention in the course of the study will be referred appropriately.

However, any possible risks or discomforts that may occur in the form of any distress will lead to the respondent's participation in the study being ended. Respondents will be given free psychosocial support and or emergency treatment where the researcher will bear the cost if the need arises.

The results of the study will help to formulate policies that will help improve and support children of teenage girls in the district. It will also help to campaign against factors leading to birth defects in these children hence promoting good health and prevention of birth defects.

Confidentiality

No name will be recorded. Your daughter's name and identity are not needed in the study. However, the information she will provide will be coded and will be treated strictly confidential. You are assured of total confidentiality to the information she will give.

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Apart from the researcher and supervisor of this research, no one else will have access to information provided whether in part or whole. Data collected will be stored under lock and key then destroyed after a minimum of three years as per research protocol.

Voluntary participation/Right to refuse

Participation in this study is voluntary. She is free to answer part or the entire questionnaire. She can choose to withdraw from the study or stop the interview at any time you want. She can also choose not to answer any question(s) she finds uncomfortable. No one will be coerced to obtain response from participants, and she is at liberty to withdraw from the study at any time and it will not affect her in any way. Taking part in the study will not affect the quality of care she and her child receive in any way. She is encouraged to participate fully in this study to help in finding the prevalence and factors associated with birth defect in children of teenage mothers.

Provision of Information sheet and Consent Forms

A copy of the information sheet and consent forms will be given to you after it has been signed or thumb-printed to take home.

Who to contact for further information and clarification:

If you have any question(s) or further clarification concerning this study and/or the conduct of the researcher and research assistants, please do not hesitate to contact the following;

1. Nelson Ahadome (Principal Investigator):

Tel: 0249379378

Email: iconhealthsystem@gmail.com

Or

2. Dr. Paulina Tindana (Supervisor):

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Tel: 0544905490

Email: ptindana@ug.edu.gh

If you have any concerns or need clarifications regarding ethical issues, please contact

Nana Abena Kwaa-Ansah Apatu (Administrator)

Ghana Health Service, Ethics Review Committee, Accra

Tel: 0302681109/0503539896

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7.4 Participant information sheet for teenage mothers 13 – 17 years

Project Title: **Factors associated with birth defects in children of teenage mothers in the Agona East District in the Central Region**

Introduction

I am **Nelson Ahadome**, a master's student of the School of Public Health, University of Ghana, Legon. I am here with my research assistants to carry out a study to find factors associated with birth defects in children of teenage mothers. Specific study sites for this project includes communities in the Agona East District. This is purely for research purposes and forms part of a requirement for an MPH degree in the School of Public Health University of Ghana. You have been selected for this study because you have the element of interest for this research.

Nature of study

This an exploratory study under social and health sciences aimed at bridging the knowledge-gap about birth defects in children of teenage mothers.

Procedure

The study will involve participants answering simple questions about the history surrounding their health and that of their children before, during, and after pregnancy. Consent of the guardians of teenage mothers below 18 years will be sought and assent forms will be signed by such teenagers but emancipated teenage mothers and teenage mothers 18 years and above will be allowed to sign just consent forms. Children of participants will be screened for birth defects. This study will last for a period of seven months (including analysis) but the interviews will only last for an hour per participant. The information the teenage mother provides will add to knowledge about factors associated with birth defects in teenage pregnancy.

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Potential Benefits and Risks

Patients who will participate in the study will have the opportunity to be educated on the importance of preventing birth defects and identifying them for early intervention. Also, respondents who will need special attention in the course of the study will be referred appropriately.

However, any possible risks or discomforts that may occur in the form of any distress will lead to the respondent's participation in the study being ended. Respondents will be given free psychosocial support and or emergency treatment where the researcher will bear the cost if the need arises.

The results of the study will help to formulate policies that will help improve and support children of teenage girls in the district. It will also help to campaign against factors leading to birth defects in these children hence promoting health and prevention.

Confidentiality

No name will be recorded. Your name and identity are not needed in the study. However, the information you are going to provide will be coded and will be treated strictly confidential. You are assured of total confidentiality to the information you will give. Apart from the researcher and supervisor of this research, no one else will have access to information provided whether in part or whole. Data collected will be stored under lock and key then destroyed after a minimum of three years as per research protocol.

Voluntary participation/Right to refuse

Participation in this study is voluntary. You are free to answer part or the entire questionnaire. You can choose to withdraw from the study or stop the interview at any time you want. You can also choose not to answer any question(s) you find uncomfortable about. No one will be coerced to obtain response from participants, and you are at liberty to withdraw from the study at any time and it will not affect you in any way. Taking part in the study

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will not affect the quality of care you receive in any way. You are encouraged to participate fully in this study to help in finding the prevalence and factors associated with birth defect in children of teenage mothers.

Provision of Information sheet and Consent Forms

A copy of the information sheet and consent forms will be given to you after it has been signed or thumb-printed to take home.

Who to contact for further information and clarification:

If you have any question(s) or further clarification concerning this study and/or the conduct of the researcher and research assistants, please do not hesitate to contact the following;

1. Nelson Ahadome (Principal Investigator):

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If you have any concerns or need clarifications regarding ethical issues, please contact

Nana Abena Kwaa-Ansah Apatu (Administrator)

Ghana Health Service, Ethics Review Committee, Accra

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Tel: 0302681109/0503539896

7.5 Participant information sheet for teenage mothers 18 years and above

Project Title: **Factors associated with birth defects in children of teenage mothers in the Agona East District in the Central Region**

Introduction

I am **Nelson Ahadome**, a master's student of the School of Public Health, University of Ghana, Legon. I am here with my research assistants to carry out a study to find factors associated with birth defects in children of teenage mothers. Specific study sites for this project includes communities in the Agona East District. This is purely for research purposes and forms part of a requirement for an MPH degree in the School of Public Health University of Ghana. You have been selected for this study because you have the element of interest for this research.

Nature of study

This an exploratory study under social and health sciences aimed at bridging the knowledge-gap about birth defects in children of teenage mothers.

Procedure

The study will involve participants answering simple questions about the history surrounding their health and that of their children before, during, and after pregnancy. Consent of the guardians of teenage mothers below 18 years will be sought and assent forms will be signed by such teenagers but emancipated teenage mothers and teenage mothers 18 years and above will be allowed to sign just consent forms. Children of participants will be screened for birth defects. This study will last for a period of seven months (including analysis) but the interviews will only last for an hour per participant. The information you provide will add to knowledge about factors associated with birth defects in teenage pregnancy.

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Potential Benefits and Risks

Patients who will participate in the study will have the opportunity to be educated on the importance of preventing birth defects and identifying them for early intervention. Also, respondents who will need special attention in the course of the study will be referred appropriately.

However, any possible risks or discomforts that may occur in the form of any distress will lead to the respondent's participation in the study being ended. Respondents will be given free psychosocial support and or emergency treatment where the researcher will bear the cost if the need arises.

The results of the study will help to formulate policies that will help improve and support children of teenage girls in the district. It will also help to campaign against factors leading to birth defects in these children hence promoting health and prevention.

Confidentiality

No name will be recorded. Your name and identity are not needed in the study. However, the information you are going to provide will be coded and will be treated strictly confidential. You are assured of total confidentiality to the information you will give. Apart from the researcher and supervisor of this research, no one else will have access to information provided whether in part or whole. Data collected will be stored under lock and key then destroyed after a minimum of three years as per research protocol.

Voluntary participation/Right to refuse

Participation in this study is voluntary. You are free to answer part or the entire questionnaire. You can choose to withdraw from the study or stop the interview at any time you want. You can also choose not to answer any question(s) you find uncomfortable about. No one will be coerced to obtain response from participants, and you are at liberty to withdraw

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from the study at any time and it will not affect you in any way. Taking part in the study will not affect the quality of care you receive in any way. You are encouraged to participate fully in this study to help in finding the prevalence and factors associated with birth defect in children of teenage mothers.

Provision of Information sheet and Consent Forms

A copy of the information sheet and consent forms will be given to you after it has been signed or thumb-printed to take home.

Who to contact for further information and clarification:

If you have any question(s) or further clarification concerning this study and/or the conduct of the researcher and research assistants, please do not hesitate to contact the following;

1. Nelson Ahadome (Principal Investigator):

Tel: 0249379378

Email: nkahadome@st.ug.edu.gh

Or

2. Dr. Paulina Tindana (Supervisor):

Tel: 0544905490

Email: ptindana@ug.edu.gh

If you have any concerns or need clarifications regarding ethical issues, please contact

Nana Abena Kwaa-Ansah Apatu (Administrator)

University of Ghana http://ugspace.ug.edu.gh

Ghana Health Service, Ethics Review Committee, Accra

Tel: 0302681109/0503539896

7.6 Consent Form for guardians of teenage mothers less than 18 years

Study title: Factors associated with birth defects in children of Teenage mothers in the Agona East District, Central Region of Ghana

I have read the information given above, and I understand. I have been given a chance to ask questions concerning this study and questions have been answered to my satisfaction. I now voluntarily agree to allow my daughter or teenage mother under my care to participate in this study knowing that she has the right to withdraw at any time without it affecting her current or future use of health care services. I have been duly informed that a copy of the information sheet and assent forms will be given to her to also sign. I am also aware copies of signed documents will be given to us to keep at home after we have signed or thumb-printed them.

Name of participant: ……

Signature/Thumb print: …… Date: ……..

I, the undersigned, have explained this consent to the respondent in English/local language that he/she understands the purpose of the study, procedures to be followed, as well as the risks and benefits of the study.

The participant has fully agreed to participate in the study without any coercion.

Name of Interviewer/translator…….....

Signature of Interviewer/translator……. Date……

University of Ghana http://ugspace.ug.edu.gh

I, the undersigned, was present as a witness when the benefits, risks and procedures were read to the participant and all questions were answered and the participant agreed to take part in the research.

Name of Witness…….....

Signature of Witness……. Date……

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

University of Ghana http://ugspace.ug.edu.gh

7.7 Assent Form for teenage mothers less than 18 years

Study title: Factors associated with birth defects in children of Teenage mothers in the Agona East District, Central Region of Ghana

I have read the information given above, and I understand. I have been given a chance to ask questions concerning this study and questions have been answered to my satisfaction. My guardian has also gone through and approved of my participation. I now voluntarily agree to participate in this study knowing that I have the right to withdraw at any time without it affecting my current or future use of health care services. I have been duly informed that copies of the information sheet and assent forms will be given to my guardian and me to take home for keeps after we have signed them.

Name of participant: ……

Signature/Thumb print: …… Date: ……..

I, the undersigned, have explained this consent to the respondent in English/local language that he/she understands the purpose of the study, procedures to be followed, as well as the risks and benefits of the study.

The participant has fully agreed to participate in the study without any coercion.

Name of Interviewer/translator…….....

Signature of Interviewer/translator……. Date……

I, the undersigned, was present as a witness when the benefits, risks and procedures were read to the participant and all questions were answered and the participant agreed to take part in the research.

Name of Witness…….....

Signature of Witness……. Date……

University of Ghana http://ugspace.ug.edu.gh

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Name of Principal Investigator…….....

Signature of Principal Investigator …… Date……..

University of Ghana http://ugspace.ug.edu.gh

7.8 Consent Form for teenage mothers 18 years and above

Study title: Factors associated with birth defects in children of Teenage mothers in the Agona East District, Central Region of Ghana

I have read the information given above, and I understand. I have been given a chance to ask questions concerning this study and questions have been answered to my satisfaction. I now voluntarily agree to participate in this study knowing that I have the right to withdraw at any time without it affecting my current or future use of health care services. I have been duly informed that copies of the information sheet and consent forms will be given me to take home for keeps after I have signed them.

Name of participant: ……

Signature/Thumb print: …… Date: ……..

I, the undersigned, have explained this consent to the respondent in English/local language that he/she understands the purpose of the study, procedures to be followed, as well as the risks and benefits of the study.

The participant has fully agreed to participate in the study without any coercion.

Name of Interviewer/translator…….....

Signature of Interviewer/translator……. Date……

I, the undersigned, was present as a witness when the benefits, risks and procedures were read to the participant and all questions were answered and the participant agreed to take part in the research.

Name of Witness…….....

Signature of Witness……. Date……

University of Ghana http://ugspace.ug.edu.gh

I certify that the participant has been given ample time to read and learn about the study. All questions and clarifications raised by the participant have been addressed.

Name of Principal Investigator…….....

Signature of Principal Investigator …… Date……..

University of Ghana http://ugspace.ug.edu.gh

GHANA HEALTH SERVICE ETHICS REVIEW COMMITTEE

In case of reply the number and date of this Letter should be quoted.

Research & Development Division
Ghana Health Service
P. O. Box MB 190
Accra
GPS Address: GA-050-3303
Tel: +233-302-681109
Fax + 233-302-685424
Mob + 233- 050-3539896
Email: ethics.research@ghsmail.org

MyRef. GHS/RDD/ERC/Admin/App 19/638
Your Ref. No.

22nd November, 2019

Nelson Ahadome
P. O. Box CT 8
Cantoment
Accra - Ghana

The Ghana Health Service Ethics Review Committee has reviewed and given approval for the implementation of your Study Protocol.

GHS-ERC Number	**GHS-ERC037/11/19**
Project Title	Factors Associated with Birth Defects in Children of Teenage Mothers in the Agona East District, Central Region
Approval Date	22nd November, 2019
Expiry Date	21st November, 2020
GHS-ERC Decision	**Approved**

This approval requires the following from the Principal Investigator

- Submission of yearly progress report of the study to the Ethics Review Committee (ERC)
- Renewal of ethical approval if the study lasts for more than 12 months,
- Reporting of all serious adverse events related to this study to the ERC within three days verbally and seven days in writing.
- Submission of a final report **after completion** of the study
- Informing ERC if study cannot be implemented or is discontinued and reasons why
- Informing the ERC and your sponsor (where applicable) before any publication of the research findings.

Please note that any modification of the study without ERC approval of the amendment is invalid.

The ERC may observe or cause to be observed procedures and records of the study during and after implementation.

Kindly quote the protocol identification number in all future correspondence in relation to this approved protocol

SIGNED.....
Dr. Cynthia Bannerman
(GHS-ERC Chairperson)

Cc: The Director, Research & Development Division, Ghana Health Service, Accra