# PREVALENCE OF SPONTANEOUS ABORTION AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS AT MUHIMBILI NATIONAL HOSPITAL IN DAR ES SALAAM, TANZANIA

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# PREVALENCE OF SPONTANEOUS ABORTION AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS AT MUHIMBILI NATIONAL HOSPITAL IN DAR ES SALAAM, TANZANIA

**By**

**Godriver Lumbugu**

**A Dissertation Submitted in (Partial) Fulfilment of the Requirements for the Degree of Master of Public Health of**

**Muhimbili University of Health and Allied Sciences**
**October, 2024**

## CERTIFICATION

The undersigned certify that they have read and hereby recommend for acceptance by Muhimbili University of Health and Allied Sciences a dissertation entitled; **"Prevalence of Spontaneous abortion and associated factors among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania",** in (partial) fulfilment of the requirements for the degree of Master of Public Health of Muhimbili University of Health and Allied Sciences.

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Supervisor

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**Date**

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**Dr. Hussein Mwanga**

Co-supervisor

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**Date**

## DECLARATION AND COPYRIGHT

I, **Godriver Lumbugu**, declare that this **dissertation** is my original work and that it has not been presented and will not be presented to any other University for a similar or any other degree award.

**Signature**……..... **Date**…….

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## DEDICATION

This dissertation is dedicated to the brave women who tirelessly give their all to save lives, despite the immense challenges they face every day. Your dedication and resilience inspire us all.

## ABSTRACT

**Background:** Healthcare profession is one of the largest and significant labour-forces in the world, with more than 75% of female of child bearing age. Healthcare professionals handling potentially harmful chemicals may be more vulnerable to unfavorable health consequences including reproductive health issues such as spontaneous abortion. Spontaneous abortion can be caused by multiple factors which include genetic and non-genetic, the major genetic cause is chromosomal defects while non-genetic may include environmental and occupational factors however, other cases have unknown causes. Occupational health issues in healthcare landscape are notably under prioritized concern in Tanzania.

**Objective:** To determine the prevalence of spontaneous abortion and associated factors among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania

**Materials and Methods:** A cross-sectional study involving 390 female workers was conducted at Muhimbili National Hospital. Self-administered questionnaires were used to collect information. Data management and analyses utilized STATA version 17. Data were coded for clear variable identification. Double data entry was performed to ensure data accuracy. Missing values and inconsistencies were identified and addressed to maintain data quality. Descriptive statistics summarized data. Means and medians for continuous variables and frequencies for categorical variables were computed. The prevalence of spontaneous abortion was derived from the number of reported cases divided by the total number of participants. Chi-square and Fisher's tests were run to assess the relationships between age, previous abortion, passive smoking, alcohol consumption, income, education level, gravidity, birth interval, previous pregnancy complication, maternal comorbidities and spontaneous abortion. Ergonomic factors, exposure to chemicals, violence and stress were also evaluated by using similar statistical tests. Modified Poisson regression analysis determined the independent effects of these variables adjusting for age, passive smoking, alcohol consumption and comorbidities to accurately estimate the relationships between the variables and spontaneous abortion, with significance established at a p-value below 0.05.

**Results:** The results from this study reveal that among the 390 healthcare workers at Muhimbili National Hospital, 52 workers (13.33%) experienced spontaneous abortion. There is positive association between comorbidities and spontaneous abortion with PR of 1.95 (95% CI: 1.14-3.33), years of experience and spontaneous abortion with PR of 1.86 (95% CI: 1.12-3.07), gravidity and spontaneous abortion with PR of 4.06 (95% CI: 2.47-6.70) for those having 4-5 pregnancies compared to those with 1-3 also, there is positive association between access to personal protective equipment (PPE) and spontaneous abortion with PR of 1.86 (95% CI: 1.05-3.20).There is negative association between parity and spontaneous abortion with PR of 0.28 (95% CI: 0.13-0.59) for participants having 1-5 children compared to those with no children.

**Conclusion and Recommendation:** The study revealed a 13.33% prevalence of spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam. Key predictors of spontaneous abortion were comorbidities, years of work experience, gravidity, parity and access to PPE. To address these factors hospital administrators are advised to conduct comprehensive health screening and regular check-ups for healthcare workers, develop education programs to raise awareness about identified risk factors, modify workplace policies to accommodate specific needs of pregnant healthcare workers and researchers should conduct further research to explore the underlying causes of unexpected association between PPE and spontaneous abortion.

# TABLE OF CONTENT

CERTIFICATION ..... i
DECLARATION AND COPYRIGHT ..... ii
ACKNOWLEDGEMENT ..... iii
DEDICATION ..... iv
ABSTRACT ..... v
TABLE OF CONTENT ..... vii
LIST OF TABLES ..... x
LIST OF FIGURES ..... xi
LIST OF ABBREVIATIONS ..... xii
DEFINITION OF TERMS ..... xiii
CHAPTER ONE ..... 1
1.0 INTRODUCTION ..... 1
1.1 Background ..... 1
1.2 Problem Statement ..... 2
1.3 Conceptual Framework ..... 3
1.4 Study rationale ..... 4
1.5 Research questions ..... 5
1.5.1 Main research question ..... 5
1.5.2 Specific research questions ..... 5
1.6 Objectives ..... 6
1.6.1 Broad objective ..... 6
1.6.2 Specific objectives ..... 6
CHAPTER TWO ..... 7
2.0 LITERATURE REVIEW ..... 7
2.1 Spontaneous abortion among healthcare workers ..... 7
2.2 Socio-demographic factors associated with spontaneous abortion ..... 8
2.3 Psychological factors associated with spontaneous abortion ..... 9
2.4 Chemical factors associated with spontaneous abortion ..... 10

2.5 Ergonomic factors associated with spontaneous abortion ..... 11
CHAPTER THREE ..... 13
3.0 MATERIALS AND METHODS ..... 13
3.1 Study design ..... 13
3.2 Study area ..... 13
3.3 Study population ..... 13
3.4 Sample size estimation ..... 14
3.5 Selection criteria ..... 15
3.5.1 Inclusion criteria ..... 15
3.5.2 Exclusion criteria ..... 15
3.6 Sampling technique ..... 15
3.7 Variables of the study ..... 16
3.7.1 Dependent (outcome) variable ..... 16
3.7.2 Independent variables ..... 17
3.8 Data collection technique and tools ..... 20
3.9 Data Management and data analysis ..... 21
3.10 Ethical issues ..... 21
CHAPTER FOUR ..... 23
4.0 RESULTS ..... 23
4.1 Prevalence of Spontaneous Abortion ..... 23
4.2 Socio-demographic Characteristics of Participants ..... 23
4.3 Work-related characteristics and distribution of spontaneous abortion ..... 29
4.4 Psychological characteristics and distribution of spontaneous abortion ..... 31
4.5 Modified Poisson regression analysis ..... 33
CHAPTER FIVE ..... 38
5.0 DISCUSSION ..... 38
5.1 Prevalence of Spontaneous abortion ..... 38
5.1.1 Socio-demographic factors associated with spontaneous abortion ..... 39
5.1.2 Work-related factors associated with spontaneous abortion ..... 40

5.1.3 Psychological factors associated with spontaneous abortion ..... 40
5.2 Study limitations and mitigations ..... 41
5.2.1 Limitations ..... 41
5.2.2 Mitigations ..... 42
CHAPTER SIX ..... 42
6.0 CONCLUSION AND RECOMMENDATION ..... 43
6.1 Conclusion ..... 43
6.2 Recommendation ..... 43
REFERENCES ..... 44
APPENDICES ..... 51
Appendix 1: English version questionnaire ..... 51
Appendix 2: Swahili version questionnaire ..... 57
Appendix 3: English consent form ..... 62
Appendix 4: Swahili Consent Form ..... 64
Appendix 5: Ethical clearance letter ..... 66
Appendix 6: Permission Letter to Conduct Research from Muhimbili National Hospital ... 68
Appendix 7: Permission Letter to Pre-test research tool at Mwananyamala ..... 70
Appendix 8: Digital Receipt ..... 71
Appendix 9: Plagiarism Report ..... 72

## LIST OF TABLES

Table 1: Variable characteristics .....18

Table 2: Socio-demographic characteristics of the study population .....24

Table 3: Spontaneous abortion across socio-demographic factors .....27

Table 4: Spontaneous abortion across various work-related factors .....30

Table 5: Comparison of spontaneous abortion across groups for psychological factors……...32

Table 6: Modified Poisson regression analysis for factors associated with spontaneous abortion .....34

## LIST OF FIGURES

Figure 1: The conceptual framework to explain factors associated with spontaneous abortion among healthcare workers ..... 4

Figure 2: Sampling process ..... 16

## LIST OF ABBREVIATIONS

| | |
|---|---|
| BMI | Body Mass Index |
| CI | Confidence Interval |
| IPC | Infection Prevention Control |
| MNH | Muhimbili National Hospital |
| PPE | Personal Protective Equipment |
| PR | Prevalence Ratio |
| WHO | World Health Organization |

## DEFINITION OF TERMS

**Healthcare worker**: A person who provides direct care and services to the sick and injured as doctors and nurses or indirectly as aides, helpers, laboratory technicians, or even handlers of medical waste.

**Chemical exposure:** A measurement of both the amount and frequency of which a substance comes into contact with a person or the environment.

**Spontaneous abortion:** Pregnancy loss occurring prior reaching the $20^{th}$ week of gestation. The diagnosis is made by ultrasound, human chorionic gonadotropin beta subunit testing and pelvic examination.

**Occupational health**: Supporting and preserving optimal levels of social and physical health of employees across various sectors: avoiding health deviations brought on by working and the protection of employees against hazards arising from conditions harmful to their well-being.

**Hazard**: A substance or process that could be harmful.

# CHAPTER ONE

## 1.0 INTRODUCTION

### 1.1 Background

Spontaneous abortion refers to a natural pregnancy loss happening prior reaching 20 weeks of gestation (1). It is among the most common pregnancy complications(2). Fetal chromosomal abnormalities, such as trisomy, monosomy, and polyploidy cause almost 60% of spontaneous abortion that occur between 6 and 10 weeks of gestation (1). Furthermore, it is believed that in certain situations, immunologic and inflammatory dysregulation may be involved, most likely because of the impact on trophoblastic invasion (3). Risk factors include age, previous spontaneous abortion, several health conditions, environmental and occupational exposures(4)

Healthcare professionals are more vulnerable to unfavorable health consequences due to a range of occupational exposures (5). Globally, healthcare workers are reported to be frequently exposed to a variety of occupational hazards, such as biological hazards and chemical hazards including anesthetic gas exposure (6), anti-cancer medication exposure (7), disinfection exposure (8), working night shifts (9), overtime (10), and prolonged standing (11). These hazards are the key risk factors that may affect pregnancy outcomes of healthcare workers (12).

Among all these hazards, ergonomics and chemical exposures are reported to be significant (13). Antineoplastic medication exposure was reported to be linked to a two-fold increased risk of spontaneous abortion in health workers(14). The same study reported a two-fold increased risk of late spontaneous abortion (12–20 weeks) with exposure to sterilizing agents such as formaldehyde, glutaraldehyde, and ethylene oxide.

In East Africa the pooled prevalence of pregnancy is 7.79%, influenced by factors such as maternal age, marital status, education, parity, age at first sexual intercourse, media exposure, and employment status (15). In Tanzania, the national abortion rate stands at 36 per 1,000 women of reproductive age, although variations exist across different regions (16). These

differences are closely linked to factors like contraceptive use, unintended pregnancies, and decisions regarding abortion in cases of unwanted pregnancies.

The issue of occupational health especially among female professionals of reproductive age remains under prioritized, these workers contribute to more than 75% of the healthcare workforce (17). It is still not clear how female workers should be handled during maternal period(18), understanding these risk factors is crucial in protecting those who provide healthcare services.

Due to the potential harm that occupational risk factors can pose to health workers, it is necessary to protect and support pregnant healthcare professionals by planning proper interventions during this period. This study intends to determine prevalence of spontaneous abortion and related variables among healthcare workers at Muhimbili National Hospital, in Dar es Salaam, Tanzania.

### 1.2 Problem Statement

Spontaneous abortion among healthcare workers is a significant public health concern. The prevalence of spontaneous abortion in hospital settings is rated to 12-24% in high income countries(19). It occurs due to factors that disrupt normal development of pregnancy. They include individual factors, work-related factors and psychological factors. Spontaneous abortion leads to emotional, physical and psychological effects.

Despite various interventions such as safety protocols to minimize exposure to harmful substances, control measures to biological hazards such as Infection Prevention Control Program and providing access to reproductive health services, spontaneous abortion among healthcare workers is still a problem. However, there are still potential gaps in workplace safety measures on handling pregnant healthcare workers at work and data on occupational health hazards in healthcare settings are scarce in most of Sub-Saharan Africa and Tanzania specifically.

Investigations on spontaneous abortion have been conducted in other occupational sections such as agriculture apart from healthcare sectors in Tanzania (20). Healthcare workers are essential in provision of health services understanding unique risk factors they face during pregnancy is vital in promoting the overall well-being of the healthcare workforce who safeguard public health. Consequently, it is necessary to concentrate on research related to the healthcare settings in order to provide findings that are relevant for intervention.

### 1.3 Conceptual Framework

Figure 1 shows how spontaneous abortion can be influenced by several factors among healthcare workers. Socio-demographic factors such as age may elevate the risk of chromosomal abnormalities, work-related factors like prolonged standing may restrict blood flow to the uterus, prolonged exposure to chemical substances may interfere with normal reproductive processes. In addition, psychological hazards like violence and prolonged stress weaken the immune system making the body more vulnerable to inflammation and infection all these factors contribute to increased risk of miscarriage.

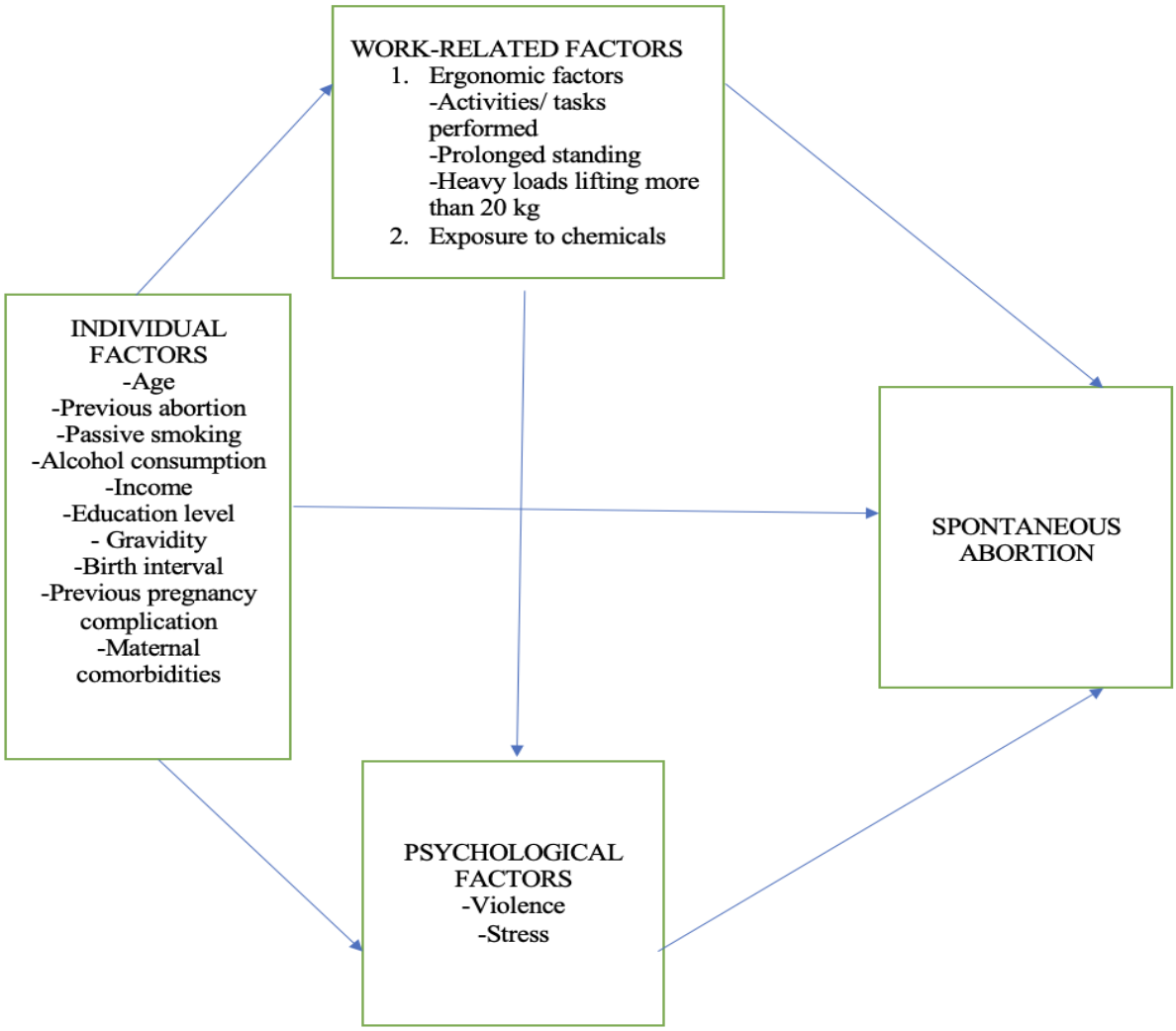



**Figure 1: The conceptual framework to explain factors associated with spontaneous abortion among healthcare workers**

### 1.4 Study rationale

Results obtained from this research may be incorporated into educational programs and training sessions, raising awareness about potential risks and how they can be minimized. The main stakeholders of this research are healthcare workers, research and training institutions, hospital administrators and professional associations.

Healthcare workers are both subjects and beneficiaries, the research aims to enhance understanding of risk factors to develop targeted interventions and improve reproductive outcomes among healthcare workers.

Research and training institutions in Tanzania will obtain evidence-based recommendations from this research. The study fills existing gap in knowledge about prevalence and factors related to spontaneous abortion among healthcare workers in Tanzania.

Hospital administrators responsible for implementing policies and providing resources will use the information to create a supportive environment by acknowledging the number of healthcare workers affected by spontaneous abortion.

Professional associations, councils and organizations such as Tanzania Nursing and Midwifery Council (TNMC), Tanzania Medical Associations (TMA), The Pharmacy council of Tanzania, Tanzania Anesthetists' Association (TAA), Tanzania association of Radiographers (TARA) and Tanzania Gender Networking Program (TGNP) will benefit from the research by advocating for better working conditions.

## 1.5 Research questions

### 1.5.1 Main research question

What is the prevalence of spontaneous abortion and associated factors among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania?

### 1.5.2 Specific research questions

1. What is the prevalence of spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania?
2. What are the individual factors associated with spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania?
3. What are the work-related factors associated with spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania?

4. What are the psychological factors associated with spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania?

## 1.6 Objectives

### 1.6.1 Broad objective

To determine the prevalence of spontaneous abortion and associated factors among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania.

### 1.6.2 Specific objectives

1. To determine the prevalence of spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania.
2. To evaluate individual factors associated with spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania.
3. To determine work-related factors associated with spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania
4. To examine psychological factors associated with spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania.

# CHAPTER TWO

## 2.0 LITERATURE REVIEW

### 2.1 Spontaneous abortion among healthcare workers

It is widely acknowledged that, in order to accomplish universal health coverage and achieve sustainable development goals (SDGs) by 2030, as well as positive outcomes at all levels, including the healthcare system, women's full engagement as healthcare providers is essential (21,22). It is reported that globally, female engagement in healthcare sectors is 70% with 75% being women of reproductive age (23). Nonetheless, there are hazardous conditions facing women working in the healthcare industry worldwide which may widely affect their health especially during maternal period (24). These effects during the maternal period include categories of adverse pregnancy outcomes, such as low birth weight, threatened or spontaneous abortion, early birth, stillbirth, and premature delivery (25). The most frequent adverse pregnancy outcomes is spontaneous abortion (24).

Globally, 12-24% of clinically identified pregnancies terminate before 20 weeks of gestation (19,26), In low- and middle-income countries like Tanzania, no conclusive research explains the prevalence of spontaneous abortion among healthcare workers (27).

In a comparison nationwide population-based study, risk of antenatal and perinatal complications was discovered by Huang et al. in nurses compared to nonmedical women workers (17). These complications included anemia, abruption placentae, and hypertensive disorders in pregnancy, preterm delivery, premature rupture of membranes, and post-term delivery. Additionally, a recent study discovered that nurses handling disinfectant had an increased risk of threatened abortion, spontaneous abortion, and stillbirth compared to those nurses not handling disinfectants (25). Some exposures have been outlined. According to a Dutch study antineoplastic medication exposure was found to have no correlation with spontaneous abortion, stillbirth, or congenital abnormalities (28). A meta-analysis that included 24 epidemiological studies of nurses revealed a higher risk of unfavorable pregnancy outcomes (29). Some studies provide results with significant low risk (30). According to Arbour's

research, congenital defects and low birth weight were less common in the children of registered nurses in Canada than in the general population (30). A meta-analysis of 2023 found that nurses who work with antineoplastic substances are more likely to experience spontaneous abortions, stillbirths, and congenital defects (27).

### 2.2 Individual factors associated with spontaneous abortion

Several individual factors have demonstrated to raise the likelihood of spontaneous abortion (31–33). These factors include age, previous pregnancy loss, passive smoking, alcohol consumption, violence, income, education level, maternity knowledge, gravidity, birth interval, previous pregnancy complications and maternal comorbidities. Maternal age is the most common risk factor for spontaneous abortion (33). For instance, the rate of spontaneous abortion in women between the ages of 20 and 30 is just 9 to 17%, whereas the rate at 45 years of age is 75 to 80%. Spontaneous abortion is also more likely in those with a history of past pregnancy loss, and the risk gets higher with every loss that follows. For instance, following one miscarriage, the likelihood of recurring in the future is roughly 20%, following two consecutive miscarriages, 28%, and after three successive miscarriages, 43% (31). Furthermore, if there is first-trimester vaginal bleeding, which can occur in up to 25% of pregnancies, the risk of spontaneous abortion increases (34).

An individual risk of experiencing spontaneous abortion can be elevated by a numerous chronic illness, such as obesity, diabetes, thyroid disease, celiac disease, hyperprolactinemia, and autoimmune diseases, including antiphospholipid syndrome (32,35). Moreover, certain infections-like syphilis, parvovirus B19, Zika virus, and Cytomegalovirus (CMV) infections are associated to increased possibility of miscarrying a child before her due date (36). It has also been demonstrated that intrauterine pregnancies with an intrauterine device still in place and structural uterine abnormalities (such as congenital malformations, leiomyoma, and intrauterine adhesions) increase the chance of miscarriage (3). Pregnancy loss risk is also elevated in chronic stress that is connected to socioeconomic determinants of health e.g., housing or food insecurity, racism, or living under violent threats (37). Alcohol use, smoking, cocaine use, and heavy caffeine consumption (e.g., consuming more than three cups of coffee per day) are other

modifiable risk factors (38). Finally, early pregnancy loss has also been related to environmental pollutants such as lead, arsenic, and organic solvents (27).

Another factor is social economic status. It is commonly known that a person's socioeconomic status (SES), which is determined by their occupation, degree of education, and money, is related to health (39). People with low socioeconomic status (SES) have a greater tendency to engage in unsafe practices and have restricted access to medical care, socioeconomic factors have a significant impact on pregnant outcomes as well as the health and life expectancies of the unborn child (40). Low-income levels have been related to a raised chance of spontaneous abortion as well as poor housing, nutrition, and access to healthcare (39). When measured by affluence or income, according to reports women with low SES are more likely to experience spontaneous abortion. However, other researches have not uncovered this relationship (41).

This study will focus on individual factors associated with spontaneous abortion among healthcare workers at Muhimbili National hospital in Dar es Salaam, Tanzania. It will provide insights on how these factors interact with healthcare workers; a population that has been underrepresented in the existing research. Additionally, it will offer valuable data that can inform hospital administrators about their contributions to spontaneous abortion and how to implement improvements.

### 2.3 Psychological factors associated with spontaneous abortion

Rates of spontaneous abortion rises as a result of increased pregnancy-specific stress in the second and third trimesters (42). Previous researches have assessed the impact of psychological factors and recurrent spontaneous abortion and revealed a higher prevalence of anxiety and depression symptoms in the recurrent spontaneous abortion group compared to the control group (42). According to Nikcevic et al. (43), nearly all women who experience recurrent spontaneous abortion also experience sadness, anxiety, and despair in addition to their physical recovery. Klier et al. found that a number of detrimental psychological issues would persist for over six months following the loss event (42). Furthermore, the association between dysfunctional marital relationships and bad psychology connected to recurrent spontaneous abortion was

reported by Kagami and his colleagues(44) . Mevorach-Zussman et al. discovered that women with recurrent spontaneous abortion experienced higher levels of anxiety and a worse quality of life as compared to healthy women (45). According to Kolte et al, women with recurrent spontaneous abortion were more likely to experience high stress levels compared to women in good health. The rate of depression in women with recurrent spontaneous abortion was more than five times greater (46).

There is still much to learn about the additional factors that raise the chance of miscarriage, despite decades of research. There is little data to support the plausible involvement of stress and mental health issues. There is evidence that women who have experienced eating disorders (47), anxiety, or depression (48), are more likely to miscarry. Most research on anxiety and sadness has focused on these mental health conditions following a miscarriage in an effort to better understand how having a miscarriage may impact a woman's mental health. For this reason, they are not examining the connection that exists between the chance of miscarriage and pre-existing anxiety or depression.

Existing research has highlighted the psychological impact of spontaneous abortion; however, there is limited understanding on how pre-existing factors such as stress and violence contribute to the risk of miscarriage. The current study seeks to examine an association between psychological factors and spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania. It will contribute to the existing body of knowledge by providing strategies on how to support healthcare workers affected by these factors.

### 2.4 Chemical factors associated with spontaneous abortion

The primary risk factor that could influence workers pregnancy outcome is the place of employment (12). Jiang and his colleagues (25) discovered that health workers who worked overtime had a higher chance of experiencing spontaneous abortion. Threatened and spontaneous abortion were more common among workers who handled disinfectant. They also discovered that workers who handled anti-cancer medications had a nearly twofold greater risk

of premature birth. Lawson et al in their study discovered that when age, parity, shift work, and hours worked were considered, exposure to antineoplastic drugs was linked to a two-fold increase in the incidence of spontaneous abortion(14).

A meta-analysis that was conducted in 2013 by Liu and his colleagues showed that health workers who worked with antineoplastic substances were more likely to experience spontaneous abortions, stillbirths, and congenital defects (27). In the study of Celikkalp and colleagues (49), it was found that respondents who gave birth early and experienced vaginal hemorrhages during their pregnancies had statistically significantly higher exposure to specific risk variables, such as working overtime and prolonged standing up at work ($p<0.05$). Working in operating room has also been observed to increase risk of spontaneous abortion. Long-term inhalation and exposure to anesthetic gases (isoflurane, sevoflurane) has been linked to a number of health effects in both humans and animals (50). These effects include increased incidence of spontaneous abortions, decreased brain function, decreased vision and hearing, abnormalities in the reproductive system, DNA damage, infertility, malignant hyperthermia, irritation of the respiratory tract, diseases of the liver and kidneys and megaloblastic anemia.

Other studies indicate a potential causal link between chemicals and spontaneous abortion, the evidence varies making it difficult to establish causality due to different confounding variables such as varying levels of exposure, the use of personal protective equipment and other occupational risks. These inconsistencies in findings highlight the need for further investigation to fully understand the association. This study aimed to determine the association between work related factors such as chemicals and spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania. It will contribute to the development of safer occupational practices in this setting.

### 2.5 Ergonomic factors associated with spontaneous abortion

Ergonomics refers to the study of how people interact with other factors to enhance performance at work (51). Hormonal and physiological changes brought on by pregnancy have an effect on the musculoskeletal system, the major reason is physically demanding tasks (52),

musculoskeletal complications are linked to miscarriage. It is necessary to identify these tasks so as to eliminate the risks, despite the fact that controls are in place and workers are aware of potential hazards, ergonomics play a significant part in improving productivity (53).

Several studies on physical activities have been linked to increased risk of unfavorable pregnancy outcomes (54), women who work evening hours are more likely to experience pregnancy loss than those who work during the day, tasks involving frequent lifting have shown vasoconstriction action which has detrimental impact on fetal development(55). Additionally, pregnant mothers who worked more than 70 hours a week reported a higher percentage of spontaneous abortion(56). Occupational lifting increases intra-abdominal pressure which is associated with both early and late miscarriage (57). Also, there is a correlation between spontaneous abortion and disparities in occupation, a study done on female urologists reported a high incidence of pregnancy problems (58).

While other studies have established a link between frequent lifting and long working hours with spontaneous abortion, there remains a lack of understanding regarding specific ergonomic risks. This research aims to determine an association between work-related factors such as activities/tasks performed, prolonged standing and heavy load lifting among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania. It will enhance awareness of the potential hazards associated with specific activities and contribute to the development of targeted interventions aimed at improving work ergonomics for pregnant workers.

# CHAPTER THREE

## 3.0 MATERIALS AND METHODS

### 3.1 Study design

The research utilized analytical cross-sectional design employing quantitative approach where information was gathered at one point in time. Information on independent variables (individual factors, psychological factors, ergonomic factors and chemical exposure) and outcome variable (spontaneous abortion) was collected allowing determination of associations between variables. The collected data enabled estimation of prevalence of spontaneous abortion within this population.

### 3.2 Study area

We carried out this research at Muhimbili National hospital a prominent medical facility within the country, serving a large number of the local population. It has a diverse number of healthcare workers allowing easy access to participants who were willing to participate. MNH can directly influence healthcare policies and practices within the hospital and Tanzania in general, potentially leading to improved healthcare services and outcomes.

"MNH is a 1500 bed capacity National Referral Hospital, University teaching hospital and research center located in Upanga, it receives 2000 outpatients daily, 1000-1,200 patients are admitted weekly. MNH offers services to about three million people in the region. MNH employs about 1800 female workers." Conducting the study at MNH in Dar es salaam, Tanzania provided insights into the specific context of healthcare workers and contributed to improving reproductive health outcomes and practices within the hospital and beyond.

### 3.3 Study population

The focus of the study was all female workers directly related to healthcare activities at MNH. It included a diverse range of professionals to capture exposure variability. The study comprised of radiologists, radiology technicians, pharmacists, pharmaceutical technicians, medical doctors, anesthesiologists, medical record officers and nurses. These workers undergo varying

levels of training and their job descriptions differ significantly. This excludes administrative and support staff who are not directly engaged in healthcare activities as their inclusion did not align with the study objective.

### 3.4 Sample size estimation

As this is the cross-sectional study, we obtained participants by using Cochran's formula (59).

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

Where by

n = sample size

z = standard normal deviation corresponding to 95% Confidence level which is 1.96

p = 0.11 (proportion of spontaneous abortion according Celikkalp (25))

e = Marginal error, 0.05 at 95% confidence interval

Hence,

$$n = \frac{1.96^2 \times 0.11(1-0.11)}{0.05^2}$$

$$= 150$$

Therefore, the initial sample size was 150

Adjustment for design effect

Adjusted sample size = Initial sample size × Design effect

$$= 150 \times 2$$

$$= 300$$

Therefore, the adjusted sample size after accounting for the design effect was 300. Accounting for a non-response rate of 30%, the total sample size of 390 female workers at MNH was required.

### 3.5 Selection criteria

#### 3.5.1 Inclusion criteria

Female employees currently at MNH in every shift.

#### 3.5.2 Exclusion criteria

1. Female who are absent because of various reasons such as maternity or long-term leave
2. Workers who are about to retire or whose last delivery was over 20 years ago.

### 3.6 Sampling technique

Figure 2 demonstrates the sampling process of selecting study participants. This study used a multi-stage random sampling technique, which is widely used to handle diverse and large populations. The technique was cost-effective and provided representation among different groups within this population. A sampling frame was obtained from Muhimbili National Hospital which has 8 directorates (the directorate of medical services, surgical services, clinical services, nursing and housekeeping services, technical services, human resource, communication technology and finance, planning and information) and 25 departments. In the first stage, 5 directorates were randomly selected of which 4 were clinical while 1 was non-clinical. Other directorates were excluded to focus on those with a higher potential of exposure to the associated risk factors. In the second stage, 5 departments from each of the 5 directorates were randomly chosen. In the third stage, individual healthcare workers were selected from each department based on calculated proportions, utilizing a table of random numbers to achieve the desired sample size of 390 participants.

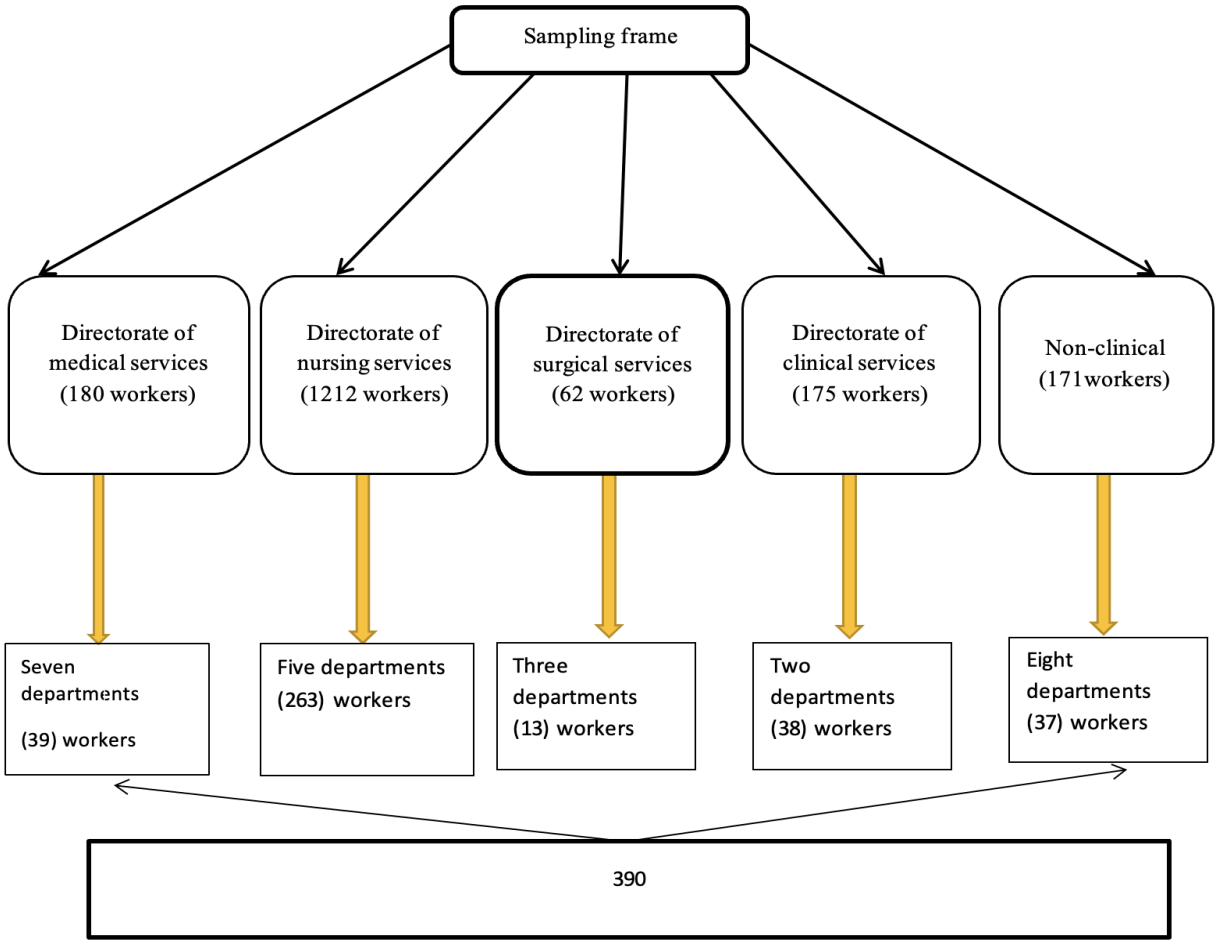



**Figure 2: Sampling process of study participants**

## 3.7 Variables of the study

### 3.7.1 Dependent (outcome) variable

Spontaneous abortion (Table 1) is the dependent variable of the study. It is defined as losing pregnancy before the period of twenty weeks. It is a categorical variable which is binary that represented the occurrence or non-occurrence of spontaneous abortion within this population. The variable was measured by asking participants whether they have ever experienced a spontaneous abortion in the past or not.

### 3.7.2 Independent variables

The independent variables of this study are individual factors, ergonomic factors, chemical and psychological factors (Table 1). Individual factors included income, education level, marital status, age, occupation, years of experience, birth interval and working department. Income was measured by asking them to report their monthly income amount which was in three income levels, <350000/=, 350000-900000/= and >900000/=, education level was measured by participants being asked to report their highest education level completed such as primary, secondary and colleges or university, participants marital status was measured by asking them to report whether they are single, married, divorced, widowed, separated or cohabited. Also, they were asked to report their age, provide their current occupation within the health sector by specifying their specific job title or role within the hospital. Participants were required to disclose how long they have worked in their current occupation to measure their years of experience and report the average of all births to capture birth spacing patterns throughout their reproductive history. Furthermore, participants were asked to indicate their specific department or unit of work.

Work-related factors were measured by factors such as activities or task performed by participants, prolonged standing, heavy loads lifting more than 20 kg and exposure to chemicals at work, participants were asked to describe their daily activities in detail, also they were asked to self-report the duration of time they spend standing in a day while working, additionally they reported the frequency and heavy weights they lift through questionnaires, moreover they were required to report any exposure to chemicals they experience at work, including the type of chemicals and duration of exposure.

Psychological factors such as violence and stress were determined by the following methods: Stress levels were measured by the use of perceived stress scale questions. Participants completed the scale to assess their levels of stress. Also, the researcher inquired about their recent stressful events. In addition, they were asked to self-report their experiences of violence, including physical, verbal or emotional abuse.

**Table 1:** Variable characteristics of the population

| **Variables** | | **Types of variables** | **Measurement** |
|---|---|---|---|
| Dependent variable | Spontaneous abortion | Categorical | Presence or absence of Spontaneous abortion |
| Independent variables | | | |
| Individual factors | Age | Discrete | Whole numbers in years |
| | Previous abortion | 1. Categorical<br>2. Discrete | 1. Yes/No<br>2. Number of previous spontaneous abortions |
| | Passive smoking | Categorical | Yes/No |
| | Alcohol consumption | 1. Categorical<br>2. Ordinal | 1. Yes/No<br>2. Once/Twice/More than twice a week |
| | Income | Ordinal | <350000/=, 350000-900000/=, >900000 |
| | Education level | Ordinal | Primary/Secondary/Colleges/University |
| | Gravidity | Discrete | Number of pregnancies |
| | Birth interval | Continuous | Time duration between successive births in months |
| | Previous pregnancy complication | Categorical | Yes/No |
| | Maternal comorbidities | Categorical | Yes/No |

**Table 1 (*continued*):** Variable characteristics

| **Variables** | | **Types of variables** | **Measurement** |
|---|---|---|---|
| Work-related factors | | | |
| 1. Ergonomics | Activities/tasks performed | 1. Categorical<br>2. Discrete | 1. Yes/No<br>2. Whole numbers representing hours of standing while working |
| 2. Exposure to chemicals | | Categorical | 1. Yes/No<br>2. Options for exposures if the response to the previous question is 'yes' |
| Psychological factors | | | |
| | Violence | 1. Categorical<br>2. Discrete<br>3. Ordinal | 1. Yes/No<br>2. Whole numbers representing the number of times the individual has experienced violence<br>3. Options indicating frequencies of verbal abuse or threats (Yes, frequently/Yes, occasionally/No, never) |
| | Stress | 1. Ordinal<br>2. Categorical | 1. Categories indicating frequency of experiencing symptoms of stress during work (daily/weekly/monthly/rarely/never)<br>2. Yes/No indicating whether participants get enough breaks |

### 3.8 Data collection technique and tools

An interviewer-administered questionnaire was used to gather information. Questions were read aloud by the interviewer and respondents' answers were recorded. This method established rapport, ensured respondents felt comfortable sharing sensitive information, provided clarification for those who had difficulty understanding and contributed to a higher response rate. The questionnaire was adapted from the research conducted in Iran among reproductive healthcare workers(60). It was modified to account for the difference in economic status and nature of the two countries. It was written in English and Kiswahili to enhance understanding and relevance. It included individual information, work-related information and psychological information.

To ensure data reliability the tool was pretested at Mwananyamala Regional Referral Hospital located in Dar es Salaam, Tanzania with 10% of the total sample size of the study population (39 participants) where prevalence of spontaneous abortion reported was 12.8%. Pretesting enabled the researcher to identify potential issues in the questionnaire which were unclear or any other problems that rose during data collection so as to refine the questionnaire before administering it to the larger population at Muhimbili National Hospital. In addition, experts in the field assessed the questionnaire to determine its validity in terms of content and necessary revisions were done.

This study involved three research assistants who were trained for three days before the data collection process began. The principal researcher provided an overview of the research project including its objectives and rationale, reviewed the questionnaire and data collection procedures in detail, addressed any potential challenges or issues that rose during data collection and handled them. The Principal Investigator provided support and supervision during the whole training period.

### 3.9 Data Management and data analysis

Data was entered in excel sheet by coding to organize and label variables for easy identification, then entered accurately and consistently by using double data entry. Data was cleaned through validation checks to detect errors. Data was checked for missing values, outliers and inconsistencies, errors that could be corrected were fixed while incomplete data was removed from the worksheet, then data analyses were performed using STATA version 17.

Descriptive statistics were computed to summarize data. For continuous variables mean and standard deviation were calculated for variables with normal distribution, median and interquartile range for variables with skewed distribution. For categorical variables frequency or proportions were calculated.

Objective 1 was measured by identifying the number of healthcare workers who reported a history of spontaneous abortion dividing by the total participants in the study. To evaluate second objective, chi square or fisher's tests were computed to figure out the relationship between individual variables and the dependent variable (spontaneous abortion). To examine third objective, fisher's and chi square tests were done to establish the link for psychological aspects and spontaneous abortion. To assess the association between variables related to work and spontaneous abortion, chi square or fisher's analysis were conducted.

Modified poisson regression analysis was performed to find out each component's independent effect. Potential confounders such as age, smoking, alcohol consumption and comorbidities were identified and adjusted to ensure accurate estimation of the relationship between independent variables and outcome variable. Significance was attributed to a p-value below 0.05.

### 3.10 Ethical issues

Asking sensitive questions about spontaneous abortion raised ethical concerns regarding privacy and confidentiality. All participants were provided with a written informed consent after clearly outlining the purpose, risks and benefits of the research. Clear written instructions were provided

to guide participants on how to fill the questionnaire. No identifying information was collected to ensure anonymity. Participants were offered emotional support in case of stress while filling the questionnaire, strict confidentiality was guaranteed to protect their privacy and prevent any potential harm.

There was no any compensation provided to the participants. All detailed records of the study protocol, data collection and participant consent were maintained so as to mitigate the risk of litigation and provide evidence in case of any legal challenges. Ethical approval was requested from the MUHAS Institutional Review Board (reference number DA.282/298/01.C/2211). Each individual had the choice to withdraw from the research at any point.

# CHAPTER FOUR

## 4.0 RESULTS

### 4.1 Prevalence of Spontaneous Abortion

The study involved 390 female healthcare workers out of the 450 people approached, yielding a response rate of 86.7%. Results showed that 52 participants (13.33%) experienced spontaneous abortion. These findings highlight that spontaneous abortion affected a small part of the study population.

### 4.2 Individual Characteristics of Participants

The individual characteristics of the study population (N=390) showed that the majority were aged 18-34 years, with 229 (58.7%). Most participants 220 (56.4%) were partnered. In terms of education, majority 171 (43.9%) had college education. Regarding BMI, 230 (60.2%) were beyond the normal (overweight, or obese). The nursing department had the highest representation with 263 (67.4%). Income levels were nearly evenly split, with 189 (48.3%) earning 350,000-900,000/= and 190 (48.7%) earning more than 900,000/=. Most participants, 265 (67.9%) had less than 10 years of working. Additionally, 257 (65.9%) had ever been pregnant, and only 44 (11.3%) had comorbidities. Almost all participants did not use tobacco, with 387 (99.2%), while 33 (8.5%) reported passive smoking, and 69 (17.7%) reported alcohol use. (**Table 2**)

**Table 2:** Individual characteristics of the study population (N = 390)

| Variable | n (%) |
|---|---|
| **Age (Median IQR)** | **32(28-40)** |
| 18-34 | 229 (58.7) |
| 35-49 | 134 (34.4) |
| 50+ | 27 (6.9) |
| **Marital Status** | |
| Not Partnered | 170 (43.6) |
| Partnered | 220 (56.4) |
| **Education level** | |
| Secondary education | 75 (19.2) |
| Colleges | 171 (43.9) |
| Universities | 144 (36.9) |
| **BMI** | |
| Normal | 152 (39.8) |
| Overweight | 163 (42.7) |
| Obese | 67 (17.5) |
| **Working Department** | |
| Medical Records | 37 (9.5) |
| Anesthesia | 13 (3.3) |
| Nursing | 263 (67.4) |
| Pharmacy | 39 (10.0) |
| Radiology | 38 (9.7) |
| **Income level (in TSh.)** | |
| 350,000-900,000 | 189 (48.3) |
| <350,000 | 11 (2.8) |
| >900,000 | 190 (48.7) |
| **Working experience (in years)** | |
| < 10 | 265 (67.9) |
| ≥ 10 | 125 (32.1) |
| **Pregnancy** | |
| No | 133 (34.1) |
| Yes | 257 (65.9) |
| **Previous complications** | |
| No | 171 (66.3) |
| Yes | 87 (33.7) |

**Table 2(continued):** Individual characteristics of the study population (N = 390)

| Variable | n (%) |
|---|---|
| **Gravidity** | |
| 1-3 | 211 (54.1) |
| 4-5 | 46 (11.8) |
| Never pregnant | 133 (34.1) |
| **Parity** | |
| 0 | 8 (2.1) |
| 1-5 | 249 (63.9) |
| Never pregnant | 133 (34.1) |
| **Birth interval** | |
| <3 | 123 (48.6) |
| >3 | 130 (51.4) |
| **Comorbidities** | |
| No | 346 (88.7) |
| Yes | 44 (11.3) |
| **Tobacco use** | |
| No | 387 (99.2) |
| Yes | 3 (0.8) |
| **Passive smoking** | |
| No | 357 (91.5) |
| Yes | 33 (8.5) |
| **Alcohol use** | |
| No | 321 (82.3) |
| Yes | 69 (17.7) |

### 4.2.1 Individual characteristics and distribution of spontaneous abortion

Among those aged 18-34 years, 29 (23.6%) had experienced spontaneous abortion, for the 35-49 age group, only 16 (21.6%) while the highest was reported among those aged 50+ at 7(26.9%). Regarding marital status, 9 (14.5%) not partnered group reported spontaneous abortion, while in the partnered group, 43 (22.3%) had experienced it. Educational level showed that among those with secondary education, 7 (14.9%) reported experiencing spontaneous abortion, while; college-educated participants had 26 (21.9%) with spontaneous, and university-educated participants had 19 (21.4%) with it. For BMI categories, 11 (14.7%) of those with normal weight reported spontaneous abortion, while among those overweight and obese, 23 (19.7%) and 18 (30.5%) had experienced it. In the working department, nursing had 32 (19%) experiencing spontaneous abortion, followed by radiology with 7 (27.9%) having experienced it. Regarding income, those earning 350,000-900,000/= had 21 (19.6%) reporting spontaneous abortion, while those earning more than 900,000/= had 30 (20.8%) with it. In terms of working experience, 20 (14.6%) with less than 10 years reported spontaneous abortion, while those with 10 or more years of experience had 32 (27.1%) with spontaneous abortion. The presence of comorbidities showed 40 (18.1%) without comorbidities reported spontaneous abortion, while; among those with comorbidities, 12 (35.3%) had experienced it. (**Table 3**)

**Table 3:** Spontaneous abortion across individual factors (N=255)

| Variable | Spontaneous Abortion | | p-value |
|---|---|---|---|
| | No (n = 203) n (%) | Yes (n = 52) n (%) | |
| **Age** | | | |
| 35-49 | 90 (84.4) | 16 (21.6) | 0.194 |
| 18-34 | 94 (76.4) | 29 (23.6) | |
| 50+ | 19 (73.1) | 7 (26.9) | |
| **Marital status** | | | |
| Not Partnered | 53 (85.5) | 9 (14.5) | 0.187 |
| Partnered | 150 (77.7) | 43 (22.3) | |
| **Education level** | | | |
| Secondary education | 40 (85.1) | 7 (14.9) | 0.582 |
| Colleges | 93 (78.2) | 26 (21.9) | |
| Universities | 70 (78.6) | 19 (21.4) | |
| **BMI** | | | |
| Normal weight | 64 (85.3) | 11 (14.7) | 0.082 |
| Overweight | 94 (80.3) | 23 (19.7) | |
| Obese | 41 (69.5) | 18 (30.5) | |
| **Working department** | | | |
| Medical Records | 9 (90) | 1 (10) | 0.414 |
| Anesthesia | 20 (69) | 9 (31) | |
| Nursing | 136 (81) | 32 (19) | |
| Pharmacy | 19 (86) | 3 (14) | |
| Radiology | 19 (73) | 7 (27) | |
| **Income level (in TSh.)** | | | |
| 350,000 - 900,000 | 86 (80.4) | 21 (19.6) | 0.948 |
| <350,000 | 3 (75.0) | 1 (25.0) | |
| >900,000 | 114 (79.2) | 30 (20.8) | |
| **Working experience (in years)** | | | |
| <10 | 117 (85.4) | 20 (14.6) | 0.013 |
| ≥10 | 114 (72.9) | 32 (27.1) | |
| **Presence of comorbidity** | | | |
| Yes | 181 (81.9) | 40 (18.1) | 0.037 |
| No | 22 (64.7) | 12 (35.3) | |

**Table 3 (*continued*):** Spontaneous abortion across individual factors (N=255)

| Variable | Spontaneous Abortion | | p-value |
|---|---|---|---|
| | No (n = 203) n (%) | Yes (n = 52) n (%) | |
| **Previous complication** | | | |
| No | 163 (97.0) | 5 (3.0) | <0.001 |
| Yes | 40 (46.0) | 47 (54.0) | |
| **Birth interval (in years)** | | | |
| < 3 | 102 (83.6) | 20 (16.4) | 0.100 |
| ≥ 3 | 97 (75.2) | 32 (24.8) | |
| **Passive smoking** | | | |
| No | 188 (80.3) | 46 (19.7) | 0.394 |
| Yes | 15 (71.4) | 6 (28.6) | |
| **Gravidity (number of children)** | | | |
| 1-3 | 182 (87.1) | 27 (12.9) | <0.001 |
| 4-5 | 21 (45.7) | 23 (54.3) | |
| **Parity (number of children)** | | | |
| 0 | 4 (50) | 4 (50) | 0.057 |
| 1-5 | 199 (80.6) | 48 (19.4) | |
| **Alcohol use** | | | |
| No | 160 (79.2) | 42 (20.8) | 0.757 |
| Yes | 43 (81.1) | 10 (19.9) | |

### 4.3 Work-related characteristics and distribution of spontaneous abortion

The distribution of spontaneous abortion across various work-related factors showed the following: Among health workers not exposed to harmful substances, 12 (19%) reported experiencing spontaneous abortions whereas those not exposed, 40 (20.8%) experienced spontaneous abortion.

The types of exposure experienced by the health workers and their corresponding proportions of spontaneous abortions were as follows: infectious diseases 1 (16.7%), anesthetic gases 11 (20.4%), solvents 10 (17.9%), anticancer agents 14 (31.8%), and radiation 4 (12.5%).

The health workers who were not trained in handling harmful substances, 17 (18.5%) experienced spontaneous abortions whereas 35 (21.5%) who were trained, experienced spontaneous abortion. Those with access to personal protective equipment (PPE), 13 (14.1%) experienced spontaneous abortions whereas 39 (23.9%) with access to PPE reported to experience spontaneous abortion.

Those with long working hours, 36 (19.8%) reported experiencing spontaneous abortions whereas those with fewer hours, 16 (21.9%) reported experiencing spontaneous abortions.

Among those not lifting heavy loads, 28 (25.2%) reported experiencing spontaneous abortions while those lifting heavy loads, 24 (16.7%) reported experiencing spontaneous abortions. (**Table 4**)

**Table 4:** Spontaneous abortion across various work-related factors (N = 255)

| Variable | Spontaneous abortion | | p-value |
|---|---|---|---|
| | No (n = 203) n (%) | Yes (n = 52) n (%) | |
| **Harmful substances** | | | 0.760 |
| No | 51 (81.0) | 12 (19.0) | |
| Yes | 152 (79.6) | 40 (20.8) | |
| **Exposure type** | | | |
| Infectious diseases | 5 (83.3) | 1 (16.7) | 0.310 |
| Anesthetic gases | 43 (79.6) | 11 (20.4) | |
| Solvents | 46 (82.1) | 10 (17.9) | |
| Anticancer | 30 (68.2) | 14 (31.8) | |
| Radiation | 28 (87.5) | 4 (12.5) | |
| **Training** | | | |
| No | 75 (81.5) | 17 (18.5) | 0.569 |
| Yes | 128 (78.5) | 35 (21.5) | |
| **Access to PPE** | | | |
| No | 79 (85.9) | 13 (14.1) | 0.062 |
| Yes | 124 (761) | 39 (23.9) | |
| **Long working Hours** | | | |
| No | 57 (78.1) | 16 (21.9) | 0.702 |
| Yes | 146 (80.2) | 36 (19.8) | |
| **Heavy loads lifting** | | | |
| No | 83 (74.8) | 28 (25.2) | 0.064 |
| Yes | 120 (83.3) | 24 (16.7) | |

### 4.4 Psychological characteristics and distribution of spontaneous abortion

Among health workers who experienced violence, 11 (23.4%) reported experiencing spontaneous abortions, while 41 (19.7%) of those who did not experience violence reported the same. Those who had adequate breaks during shift, 22 (21%) experienced spontaneous abortions and those who did not have adequate breaks, 30 (20%) reported to experiencing spontaneous abortion. Among respondents who did not have areas for rest during breaks, 23 (21.5%) reported experiencing spontaneous abortions whereas those who had areas for rest, 29 (17.2%) reported experiencing spontaneous abortions.

Regarding stress during shifts, those who never or rarely experienced stress, 32 (18.9%) reported a history of spontaneous abortions whereas those stressed daily or weekly, 13 (21.3%) reported experiencing spontaneous abortions and those stressed monthly, 7 (28%) reported experiencing spontaneous abortions. Those without adequate work facilities, 23 (20.5%) reported experiencing spontaneous abortions while those with adequate work facilities, 29 (20.3%) reported experiencing spontaneous abortions.

The health workers who reported difficulty sleeping were 178 respondents where 32 (18%) experienced spontaneous abortions. Among those who did not have difficulty sleeping, 20 (26.0%) experienced spontaneous abortions. Those who never experienced verbal abuse or threats, 9 (20.9%) reported a history of spontaneous abortions and those who experienced frequent verbal abuse or threats, 10 (13.0%) reported experiencing spontaneous abortions whereas those who experienced occasional verbal abuse or threats, 33 (24.4%) reported experiencing spontaneous abortions. (**Table 5**)

**Table 5:** Comparison of spontaneous abortion across groups for psychological factors (N = 255)

| Variable | Spontaneous Abortion | | p-value |
|---|---|---|---|
| | No (n = 203) n (%) | Yes (n = 52) n (%) | |
| **Experience of Violence** | | | |
| No | 167 (80.3) | 41 (19.7) | 0.570 |
| Yes | 36 (76.6) | 11 (23.4) | |
| **Adequate breaks during shift** | | | |
| No | 120 (80.0) | 30 (20.0) | 0.853 |
| Yes | 83 (79.0) | 22 (21.0) | |
| **Areas for rest during breaks** | | | |
| No | 89 (79.5) | 23 (21.5) | 0.960 |
| Yes | 114 (79.7) | 29 (17.2) | |
| **Stress during shift** | | | |
| Never or rarely | 137(81.1) | 32(18.9) | 0.564 |
| Daily or weekly | 48(78.7) | 13(21.3) | |
| Monthly | 18(72.0) | 7(28) | |
| **Adequate facilities for work** | | | |
| No | 89 (79.5) | 23 (20.5) | 0.960 |
| Yes | 114 (79.7) | 29 (20.3) | |
| **Difficulty sleeping** | | | |
| No | 57 (74.0) | 20 (26) | 0.146 |
| Yes | 146 (82.0) | 32 (18.0) | |
| **Verbal Abuse/ Threats** | | | |
| No never | 34 (79.1) | 9 (20.9) | 0.137 |
| Yes frequently | 67 (87.0) | 10 (13) | |
| Yes occasionally | 102 (75.6) | 33 (24.4) | |

### 4.5 Modified Poisson regression analysis

In the modified Poisson regression analysis, several variables were identified as significantly associated with spontaneous abortion. There was a positive association between comorbidities and spontaneous abortion PR of 1.95 (95% CI: 1.14-3.33). Healthcare workers with comorbidities had 95% higher prevalence compared to those without comorbidities. There was positive association between years of work experience and spontaneous abortion PR of 1.86 (95% CI: 1.12-3.07). Participants with 10 or more years of work experience had 86% higher prevalence compared to those with less than 10 years of experience. There was positive association between gravidity and spontaneous abortion PRs of 4.06 (95% CI: 2.47-6.70). The study subjects with 4-5 pregnancies have 306 % higher prevalence of spontaneous abortion compared to study subjects with 1-3 pregnancies.

There was negative association between parity and spontaneous abortion PRs of 0.28 (95% CI: 0.13-0.51). Participants with parity of 1-5 children have 72% lower prevalence of spontaneous abortion compared to those with no children. Other individual characteristics were not statistically significant in the multivariable analysis.

Access to personal protective equipment (PPE) was associated with a positive association between those who used PPE and spontaneous abortion 1.86 (95% CI: 1.05-3.20), Those who used PPE had 86% higher prevalence compared to individuals without access to PPE. Other work-related factors such as type of exposure, training, lifting heavy loads and long working hours showed no significant association in the multivariable analysis regression.

Psychological factors, such as experience of violence and verbal abuse, difficulty sleeping, adequate facilities, breaks and resting areas during shift, were also associated with spontaneous abortion in the univariate analysis but no significant associations were seen in the multivariable regression analysis. (**Table 6**)

**Table 6:** Modified Poisson regression analysis for factors associated with spontaneous abortion (N=255)

| Variable | N | Univariate Regression | | Multivariable regression | |
|---|---|---|---|---|---|
| | | PR (95% CI) | p-value | PR (95% CI) | p-value |
| **Individual variables** | | | | | |
| **Age groups (in years)** | | | | | |
| 35-49 | n=106 | 1 | | | |
| 18-34 | n=123 | 0.67(0.39-1.18) | 0.166 | 0.64(0.37-1.11) | 0.114 |
| 50+ | n=26 | 1.08(0.49-2.17) | 0.928 | 1.14(0.56-2.32) | 0.714 |
| **Marital Status** | | | | | |
| Not partnered | n=62 | 1 | | | |
| Partnered | n=193 | 1.47(0.77-2.83) | 0.244 | 1.53(0.79-2.97) | 0.203 |
| **Education level** | | | | | |
| Secondary education | n=47 | 1 | | | |
| Colleges | n=119 | 1.34(0.64-2.80) | 0.439 | 1.47(0.68-3.15) | 0.326 |
| Universities | n=89 | 1.46(0.68-3.13) | 0.355 | 1.43(0.65-3.17) | 0.373 |
| **BMI categories** | | | | | |
| Normal weight | n=75 | 1 | | | |
| Overweight | n=178 | 1.34(0.69-2.59) | 0.383 | 1.25(0.63-2.47) | 0.522 |
| Obese | n=59 | 2.08(1.07-4.06) | 0.032 | 1.70(0.84-3.46) | 0.141 |
| **Department** | | | | | |
| Medical Records | n=29 | 1 | | | |
| Anesthesia | n=10 | 0.35(0.05-2.63) | 0.307 | 0.32(0.05-2.20) | 0.263 |
| Nursing | n=168 | 0.69(0.37-1.30) | 0.251 | 0.61(0.33-1.15) | 0.127 |
| Pharmacy | n=22 | 0.48(0.14-1.64) | 0.246 | 0.44(0.13-1.44) | 0.174 |
| Radiology | n=26 | 0.93(0.39-2.21) | 0.868 | 0.88(0,38-2.00) | 0.739 |
| **Income level (in TSh.)** | | | | | |
| 350,000-900,000 | n=107 | 1 | | | |
| <350,000 | n=4 | 1.85(0.32-10.62) | 0.491 | 1.27(0.22-7.2) | 0.786 |
| >900,000 | n=144 | 1.03(0.60-1.77) | 0.908 | 1.06(1.06-1.7) | 0.815 |

**Table 6 (*continued*):** Modified Poisson regression analysis for factors associated with spontaneous abortion (N=255)

| Variable | n | Univariate Regression | | Multivariable regression | |
|---|---|---|---|---|---|
| | | PR (95% CI) | p-value | PR (95% CI) | p-value |
| **Individual variables** | | | | | |
| **Comorbidities** | | | | | |
| No | n=221 | 1 | | | |
| Yes | n=34 | 1.77(0.99-3.15) | 0.053 | 1.95(1.14-3.33) | 0.015 |
| **Work experience (in years)** | | | | | |
| <10 | n=137 | 1 | | | |
| ≥10 | n=118 | 1.69(0.85-3.66) | 0.133 | 1.86(1.12-3.07) | 0.016 |
| **Birth interval (in years)** | | | | | |
| ≥3 | n=122 | 1 | | | |
| <3 | n=129 | 0.74(0.44-1.26) | 0.271 | 0.66(0.40-1.09) | 0.106 |
| **Gravidity (no. of pregnancies)** | | | | | |
| 1-3 | n=209 | 1 | | | |
| 4-5 | n=44 | 4.21(2.71-6.54) | <0.001 | 4.06(2.47-6.70) | <0.001 |
| **Parity (number of children)** | | | | | |
| 0 | n=8 | 1 | | | |
| 1-5 | n=223 | 0.28(0.19-0.81) | 0.012 | 0.28(0.13-0.59) | 0.001 |
| **Passive smoking** | | | | | |
| No | n=234 | 1 | | | |
| Yes | n=21 | 1.35(0.63-2.91) | 0.438 | 1.45(0.70-2.00) | 0.312 |
| **Alcohol consumption** | | | | | |
| No | n=202 | 1 | | | |
| Yes | n=53 | 0.86(0.45-1.64) | 0.650 | 0.91(0.40-1.6) | 0.759 |

**Table 6 (*continued*):** Modified Poisson regression analysis for factors associated with spontaneous abortion (N=255)

| Variable | n | Univariate Regression | | Multivariable regression | |
|---|---|---|---|---|---|
| | | PR (95% CI) | p-value | PR (95% CI) | p-value |
| **Work -related variables** | | | | | |
| **Harmful substances** | | | | | |
| No | n=63 | 1 | | | |
| Yes | n=192 | 1.09 (0.61-2.00) | 0.762 | 1.12(0.63-1.99) | 0.709 |
| **Exposure type** | | | | | |
| Anesthetic gases | n=6 | 1 | | | |
| Infectious diseases | n=54 | 0.82(0.13-5.31) | 0.833 | 1.12(0.17-7.40) | 0.904 |
| Solvents | n=56 | 0.88(0.41-1.90) | 0.738 | 0.96(0.44-2.00) | 0.923 |
| Anticancer drugs | n=44 | 1.56(0.79-3.10) | 0.201 | 1.58(0.81-3.00) | 0.181 |
| Radiations | n=32 | 0.61(0.21-1.77) | 0.368 | 0.61(0.22-1.70) | 0.353 |
| **Training** | | | | | |
| No | n=92 | 1 | | | |
| Yes | n=163 | 1.16(0.69-1.90) | 0.572 | 1.16(0.69-1.90) | 0.572 |
| **Lifting Heavy loads (in kg)** | | | | | |
| ≥20 | n=133 | 1 | | | |
| <20 | n=11 | 2.42(1.00-5.85) | 0.050 | 2.04(0.89-4.70) | 0.139 |
| **Access to PPE** | | | | | |
| No | n=92 | 1 | | | |
| Yes | n=163 | 1.69(0.95-3.00) | 0.072 | 1.86(1.05-3.20) | 0.033 |
| **Long working hours** | | | | | |
| No | n=73 | 1 | | | |
| Yes | n=182 | 0.90(0.53-1.50) | 0.701 | 0.86(0.52-1.40) | 0.160 |

**Table 6 (*continued*):** Modified Poisson regression analysis for factors associated with spontaneous abortion (N=255)

| Variable | n | Univariate Regression | | Multivariable regression | |
|---|---|---|---|---|---|
| | | PR (95% CI) | p-value | PR (95% CI) | p-value |
| **Psychological variables** | | | | | |
| **Experience of violence** | | | | | |
| No | n=208 | 1 | | | |
| Yes | n=47 | 1.07(0.58-1.90) | 0.819 | 1.19(0.66-2.15) | 0.566 |
| **Adequate breaks during shift** | | | | | |
| No | n=150 | 1 | | | |
| Yes | n=105 | 1.05(0.65-1.00) | 0.828 | 1.05(0.64-1.71) | 0.853 |
| **Areas for rest during shift** | | | | | |
| No | n=191 | 1 | | | |
| Yes | n=64 | 0.81(0.45-1.40) | 0.478 | 0.80(044-1.46) | 0.470 |
| **Stress during shift** | | | | | |
| Never/rarely | n=169 | 1 | | | |
| Daily/weekly | n=61 | 1.17(0.66-2.07) | 0.595 | 1.13(0.63-2.00) | 0.687 |
| Monthly | n=25 | 1.59(0.81-3.11) | 0.178 | 1.48(0.73-2.99) | 0.276 |
| **Adequate facilities for work** | | | | | |
| No | n=112 | 1 | | | |
| Yes | n=143 | 1.13(0.67-1.80) | 0.649 | 0.99(0.61-1.61) | 0.960 |
| **Difficulty sleeping** | | | | | |
| No | n=77 | 1 | | | |
| Yes | n=78 | 0.72(0.44-1.19) | 0.203 | 0.69(0.42-1.13) | 0.142 |
| **Experience of verbal abuse** | | | | | |
| No never | n=43 | 1 | | | |
| Yes frequently | n=77 | 0.59(0.26-1.33) | 0.205 | 0.62(0.27-1.41) | 0.255 |
| Yes occasionally | n=135 | 1.11(0.58-2.15) | 0.744 | 1.17(0.61-2.25) | 0.642 |

**Key**: PR, Prevalence ratio; CI, Confidence interval; kg, kilogram; TSh., Tanzanian shillings

# CHAPTER FIVE

## 5.0 DISCUSSION

The study aimed to determine the prevalence and associated factors of spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania. The individual characteristics revealed that majority of participants were young, partnered, and college-educated. Most worked in the nursing department, had greater or equal than ten years of work experience, and had been pregnant before. The prevalence of spontaneous abortion was found to be >10%.

Individual factors such as age, marital status, education level, BMI, department, income, work experience, and presence of comorbidities were compared among those who had experienced spontaneous abortion. Work-related factors such as exposure to harmful substances, access to personal protective equipment (PPE), and long working hours, were evaluated. Psychological factors such as experiencing violence, adequate breaks, resting areas, and stress levels were also examined. Modified Poisson regression analysis identified significant associations with comorbidities, work experience, gravidity, parity and access to PPE.

### 5.1 Prevalence of Spontaneous abortion

We found the prevalence of 13.33% indicating that a significant portion of the healthcare workforce has experienced spontaneous abortion, suggesting the presence of occupational hazards may contribute to this outcome(14). The statistic highlights the importance of implementing effective workplace policies and health support systems to mitigate these risks. The prevalence of spontaneous abortion reported in this study aligns with other literature that indicates that the prevalence of spontaneous abortion globally ranges from 12 to 24% (19). These variations can be due to differences in healthcare systems, workplace environments, and occupational health policies.

This prevalence suggests that Tanzanian healthcare workers face similar risks and challenges as their counterparts in other parts of the world. The prevalence observed in this study may reflect adherence to infection prevention (IPC) principles that emphasize on safe use of personal protective equipment (61) and regular training provided to healthcare workers (62). In Sub-Saharan Africa, studies on the prevalence of spontaneous abortion among healthcare workers are limited and data on the prevalence of spontaneous abortion in Africa are generally scarce.

### 5.1.1 Individual factors associated with spontaneous abortion

Key variables such as comorbidities, years of work experience, gravidity and parity were identified. Specifically, healthcare workers with comorbidities and those with over 10 years of experience exhibited a significantly higher prevalence of spontaneous abortion. Gravidity was notably associated with increased risk, while parity appeared to provide a protective effect against spontaneous abortion. These findings underscore the importance of addressing these variables to improve maternal health outcomes within this population.

When contextualizing these results, the association between comorbidities and spontaneous abortion is consistent with other global studies highlighting how underlying health conditions can adversely affect pregnancy outcomes. For instance, a case control study by Hashemi and colleagues found that women with chronic conditions such as hypertension and diabetes have higher rates of miscarriage (63). The high demands placed on professionals at MNH, coupled with underlying health issues, may elevate the risk of spontaneous abortion. This highlights the urgent need for wellness programs as part of the hospital's initiatives. By fostering a supportive environment for staff who are navigating the challenges of their profession alongside personal health concerns, we can potentially mitigate these risks and prevent an increase in prevalence.

In the current study a significant association between years of work experience and spontaneous abortion suggests that longer exposure to occupational hazards may impact reproductive health. The observed correlation between years of experience and spontaneous abortion aligns with other findings, including a cross-sectional study done by Shagheibi and colleagues which

showed a significant relationship between work experience of more than 15 years and spontaneous abortion (1).

The relationship between gravidity and spontaneous abortion coincides with some findings in Iran, where higher gravidity was often associated with higher risks of miscarriage (64). The reason for the observed similarity may be linked to advanced maternal age (33) as women who have been pregnant many times are often older and these women are more likely to experience chromosomal abnormalities in the fetus which can lead to miscarriage.

In contrast to a study in the Middle East, which found that nulliparous women had a lower risk of spontaneous abortion compared to multiparous women (65), our findings suggest that in Tanzania, multiparous women may benefit from protective effects due to greater pregnancy experience and improved maternal health-seeking behaviors.

### 5.1.2 Work-related factors associated with spontaneous abortion

One unexpected finding was the significant association of factors such as access to personal protective equipment (PPE) with spontaneous abortion, with a prevalence ratio indicating increased risk. This finding suggests that PPE are highly provided to people working in high-risk areas (66) in comparison to those working in low-risk areas where access to such protective measures is less emphasized therefore, other measures such as job rotation policies may be considered by hospital administrators so as to reduce the prevalence and promote employee's health.

### 5.1.3 Psychological factors associated with spontaneous abortion

The study found lack of significant associations for psychological factors like violence and stress, lack of significant association was shown in both univariate and multivariable analysis, this is attributed to individual variation in response to stress hence making comparison of stress among individuals to be challenging (67).

In comparison to the present study which has not shown significant association between stress and spontaneous abortion, a systematic review conducted in Portugal reported that, work stress among women having full-time work was associated with menstrual disorders interfering with reproductive health therefore raising the risk of spontaneous abortion (68). The divergence in findings underscores the complexity of stress in relation to reproductive outcomes suggesting the potential of stress to affect pregnancy not to be overlooked.

In another study conducted in Ethiopia, intimate partner violence was found to be significantly associated with spontaneous abortion (69). In contrast, the current study revealed that majority of participants did not report experiences of violence during pregnancy. While we did not observe pronounced direct psychological effects in our findings, the absence of reported violence is still a serious concern. This discrepancy highlights the importance of contextual factors and cultural differences in understanding the relationship between intimate partner violence and negative reproductive health outcomes such as spontaneous abortion.

The findings obtained from these studies suggest that, further research is needed to understand the nuanced interactions between stress, violence and spontaneous abortion so as to ensure a supportive environment for workers navigating both work and reproductive responsibilities.

## 5.2 Study limitations and strengths

### 5.2.1 Limitations

These findings cannot be generalized to other populations with different occupational risks because the study was conducted in a single healthcare facility. Additionally, it used a cross-sectional study design, which captures associations at a single point in time, limiting the ability to identify causality. The study relied on self-reported information, which raises the possibility of socially desirable responses.

### 5.2.2 Strengths

This study aligns with current public health priorities, given the global focus on maternal health issues and occupational health, adding valuable data that can influence both policy and practice. Our study was conducted at a major hospital in Tanzania, contributing to a body of knowledge that impacts local and national healthcare practices. It focused on healthcare workers, providing insights into a unique group with specific occupational risks. The sample size was sufficient for detecting meaningful associations between various factors and spontaneous abortion. Adjusting for potential confounders ensured accuracy, reflecting the true nature of the associations.

# CHAPTER SIX

## 6.0 CONCLUSION AND RECOMMENDATION

### 6.1 Conclusion

The findings from this study indicate that the prevalence of spontaneous abortion among healthcare workers at Muhimbili National Hospital in Dar es Salaam Tanzania, is 13.33%. Several predictors of spontaneous abortion were identified, including the presence of comorbidities, gravidity, parity and access to PPE. Health workers with mentioned risk factors have higher prevalence of spontaneous abortion compared to those without these risk factors, higher gravidity significantly increased the risk while having children showed a protective effect against spontaneous abortion. Furthermore, unexpected association between PPE suggests that merely providing PPE may not suffice hence to ensure safety of female employees, work policies and protocols must be modified especially during pregnancy. These findings emphasize the need for targeted interventions to address the risk factors associated with spontaneous abortion in this population.

### 6.2 Recommendation

To address the associations of spontaneous abortion identified in this study, several recommendations could be made.

1. Hospital administrators may implement comprehensive health screenings and regular check-ups programs for healthcare workers to identify comorbidities and provide targeted health interventions to manage these conditions effectively.
2. Develop education programs to raise awareness among healthcare workers about risk factors associated with spontaneous abortion, emphasizing the importance of monitoring gravidity and parity.
3. Modify workplace policies to accommodate pregnant healthcare workers by offering flexible hours, reduced shifts, and adjusted work assignments.
4. Researchers may conduct further research to explore the underlying cause of unexpected association between PPE and spontaneous abortion.

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# APPENDICES

## Appendix 1: English version questionnaire

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES**

**SCHOOL OF PUBLIC HEALTH AND SOCIAL SCIENCES**

**ENGLISH QUESTIONNAIRE**

**PREVALENCE OF SPONTANEOUS ABORTION AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS AT MUHIMBILI NATIONAL HOSPITAL IN DAR ES SALAAM, TANZANIA**

**QUESTIONNAIRE NO:**

### Introduction

Questionnaire to determine the prevalence of spontaneous abortion and associated factors among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania conducted from May 2024 to June 2024.

### Instructions

This questionnaire consists of three sections: individual, work-related and psychological information. There are 43 closed-ended questions, which are to be filled out under supervision of research assistants during interviews based on the participants' responses.

Date of interview.....

Time of interview……

Name of the researcher/research assistant …….…….

Researcher/research assistant phone number……

**SECTION ONE: INDIVIDUAL INFORMATION**

1. Age (in years): ……
2. Weight (in kilogram) …….
3. Height (in centimeter) ……
4. Marital status [ ]
    a) Married
    b) Single
    c) Divorced
    d) Widowed
    e) Separated
    f) Cohabited

5. Job title: ……
6. Working Department: ……...
7. Working experience (years) …….
8. How many hours in a day do you work at Muhimbili National Hospital?.....
9. Income level [ ]
    a) <350000/=
    b) <350000-900000/=
    c) >900000/=
10. Education level [ ]
    a) Primary education
    b) Secondary education
    c) Colleges
    d) Universities

11. Have you ever been pregnant?

    YES [ ]  NO [ ]

12. If yes, how many pregnancies have you ever had? ……

13. How many children are alive?.....

14. What is the birth interval of your children in years?.....

15. Have you ever experienced any complication during previous pregnancies?

    YES [ ]  NO [ ]

16. Have you ever experienced spontaneous abortion?

    YES [ ]  NO [ ]

17. If yes, at what gestation week did it occur?.....

18. How many spontaneous abortions have you experienced?.....

19. Do you have any existing medical conditions?

    YES [ ]  NO [ ]

20. If yes, mention them……

21. Do you have a history of cigarette or tobacco use?

    YES [ ]  NO [ ]

22. Do you live with people who smoke cigarette or tobacco?

    YES [ ]  NO [ ]

23. Do you consume alcohol?

    YES [ ]  NO [ ]

24. If yes, how frequently [ ]

    a) Less than once a week
    b) Once a week
    c) Twice a week
    d) More than twice a week

**SECTION TWO: WORK-RELATED INFORMATION**

1. Do you have regular exposure to chemicals or hazardous materials in your workplace?

   YES [ ] NO [ ]

2. If yes, choose from the following [ ]
   a) Anesthetic gases
   b) Anticancer drugs
   c) Solvents
   d) Radiations
   e) Infectious diseases

3. Have you received training on how to handle potentially harmful substances?

   YES [ ] NO [ ]

4. Are you involved in tasks that require heavy lifting or strenuous physical activities?

   YES [ ] NO [ ]

5. If yes, how heavy are the loads you lift? [ ]
   a) ≥20 kg
   b) <20 kg

6. Do you have access to proper protective equipment at work?

   YES [ ] NO [ ]

7. Do you work long hours or irregular shifts?

   YES [ ] NO [ ]

8. How many hours in a day do you work at Muhimbili National Hospital?.....

9. How many hours do you stand while working…….

**SECTION THREE: PSYCHOLOGICAL INFORMATION**

1. Have you ever experienced violence at home during gestation?

   YES [ ] NO[ ]

2. If yes, how many times did you experience violence?.....
3. Are you provided with adequate breaks during your shifts?

   YES [ ] NO [ ]

4. Do you have adequate resting areas for rest during break time??

   YES [ ] NO [ ]

5. How frequently, do you experience physical symptoms of stress like headaches during work? [ ]
   a) Daily
   b) Weekly
   c) Monthly
   d) Rarely
   e) Never

6. Are there adequate facilities for work at your facility?

   YES [ ] NO [ ]

7. Do you have difficulty sleeping due to stress? [ ]

   YES [ ] NO [ ]

8. How many times do you experience stress? [ ]
   a) Very often
   b) Often
   c) Sometimes
   d) Rarely
   e) Never

9. Do you get enough support from your colleagues or supervisors when dealing with work-related stress? [ ]

a) Very often
b) Often
c) Sometimes
d) Rarely
e) Never

10. Have you ever experienced verbal abuse or threats of violence in the workplace? [ ]

a) Yes, frequently
b) Yes, occasionally
c) No, never

**Appendix 2: Swahili version questionnaire**

**CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI MUHIMBILI**

**SHULE YA AFYA YA UMMA NA SAYANSI YA JAMII**

**Dodoso la kiswahili**

**UTAFITI WA KUCHUNGUZA NA KUTATHMINI UTOKEAJI WA MIMBA KUHARIBIKA PASIPO KUTARAJIA NA VIASHIRIA VINAVYOHUSIANA NA KUSABABISHA MIMBA KUHARIBIKA MIONGONI MWA WAFANYAKAZI WA AFYA KATIKA HOSPITALI YA TAIFA YA MUHIMBILI DAR ES SALAAM, TANZANIA KUANZIA MEI 2024 MPAKA JUNI 2024**

**Namba ya dodoso:**

**Utangulizi**

Dodoso hili ni kwa ajili ya kuchunguza na kutathmini utokeaji wa mimba kuharibika pasipo kutarajia na viashiria vinavyohusiana na kusababisha mimba kuharibika miongoni mwa wafanyakazi wa afya katika hospitali ya taifa ya Muhimbili Dar es salaam, Tanzania kuanzia Mei 2024 mpaka Juni 2024.

**Maelekezo**

Dodoso hili lina sehemu tatu ambazo ni taarifa binafsi, mazingira ya kazi na taarifa za kisaikolojia. Jumla ya maswali 43 yatajibiwa na washiriki, ambao ni wafanyakazi wa afya katika hospitali ya taifa ya Muhimbili Dar es salaam, Tanzania na kujazwa kwenye fomu hii chini ya

usaidizi wa watafiti wakati wa mahojiano, kwa kuweka alama ya vema kwenye jibu lililochaguliwa.

Tarehe ya mahojiano……

Muda wa mahojiano……

Jina la mtafiti/mtafiti msaidizi……

Namba ya simu ya mtafiti/mtafiti msaidizi……

**SEHEMU YA KWANZA: TAARIFA BINAFSI**

1. Umri (miaka): …….
2. Uzito (kilogramu) ……
3. Urefu (sentimita) …….
4. Hali ya Mahusiano [ ]
    a) Nimeolewa
    b) Sijaolewa
    c) Talaka
    d) Mjane
    e) Nimeachika
    f) Tunaishi pamoja
5. Cheo kazini: …….
6. Idara unayofanyia kazi: …….
7. Uzoefu kazini (miaka)……
8. Je, unafanya kazi masaa mangapi katika Hospitali ya Taifa ya Muhimbili?.....
9. Kipato [ ]
    a) <350000/=
    b) 350000-900000/=
    c) >900000/=

10. Kiwango cha elimu [ ]
    a) Elimu ya msingi
    b) Elimu ya sekondari
    c) Chuo
    d) Chuo kikuu
11. Je, umewahi kuwa mjamzito?

    NDIYO [ ] HAPANA [ ]

12. Ikiwa ndio, mara ngapi?
13. Watoto wangapi wako hai?
14. Watoto wako wamepishana kwa miaka mingapi kuzaliwa?.....
15. Je umewahi kupata matatizo yoyote wakati wa ujauzito uliopita?

    NDIYO [ ] HAPANA [ ]

16. Umewahi kutoa ujauzito bila kutarajia?

    NDIYO [ ] HAPANA [ ]

17. Ikiwa ndio, ni wiki ya ngapi ujauzito ulitoka?.....
18. Je, umepitia hali hii mara ngapi?.....
19. Je, una matatizo yoyote ya kiafya yanayojulikana?

    NDIYO [ ] HAPANA [ ]

20. Ikiwa ndio, taja…….
21. Je, una historia ya kutumia sigara au tumbaku?

    NDIYO [ ] HAPANA [ ]

22. Je, unaishi na watu wanaovuta sigara au tumbaku?

    NDIYO [ ] HAPANA [ ]

23. Je, unatumia pombe?

    NDIYO [ ] HAPANA [ ]

24. Ikiwa ndio, mara ngapi? [ ]
    a) Chini ya mara 1 kwa wiki
    b) Mara moja kwa wiki
    c) Mara 2 kwa wiki
    d) Zaidi ya mara 2 kwa wiki

**SEHEMU YA PILI: TAARIFA ZA MAZINGIRA YA KAZI**

1. Je, unakutana na kemikali au vitu hatari kazini mara kwa mara?

   NDIYO [ ] HAPANA [ ]

2. Ikiwa ndio, chagua sababu zifuatazo [ ]
   a) Dawa za usingizi
   b) Dawa za saratani
   c) Dawa za kusafishia
   d) Mionzi
   e) Magonjwa ya kuambukiza

3.Je, umewahi kupokea mafunzo yoyote kuhusiana na namna ya kutumia vitu vinavyoweza kuwa hatari?

   NDIYO [ ] HAPANA [ ]

4. Je, unajihusisha na kazi za kubeba vitu vizito?

   NDIYO [ ] HAPANA [ ]

5. Ikiwa ndio, vinakuwa na uzito kiasi gani?
   a) ≥20 kg
   b) <20 kg

6. Je, una vifaa sahihi vya kinga kazini?

   NDIYO [ ] HAPANA [ ]

7. Je, unafanya kazi muda mrefu kuliko masaa ya kazi?.....
8. Je, unafanya kazi saa ngapi kwa wiki katika hospitali ya Taifa ya Muhimbili?.....
9. Je, unasimama masaa mangapi mfululizo wakati wa kazi?.....

**SEHEMU YA TATU: TAARIFA ZA KISAIKOLOJIA**

1. Je, umewahi kupitia vurugu wakati wa ujauzito katika nyumba yako?

   NDIYO [ ] HAPANA [ ]

2. Ikiwa ndio, ni mara ngapi?.....
3. Je, unapata mapumziko ya kutosha wakati wa zamu yako?

   NDIYO [ ] HAPANA [ ]

4. Je, kuna maeneo ya kutosha ya kupumzika kazini wakati wa mapumziko?

   NDIYO [ ] HAPANA [ ]

5. Je, ni mara ngapi, unahisi dalili za uchovu wa akili kama kuumwa kichwa wakati wa kazi?
   a) Kila siku
   b) Kila wiki
   c) Kila mwezi
   d) Mara chache
   e) Haijawahi kutokea

6. Je, kuna miundo mbinu ya kutosha ya kufanyia kazi?

   NDIYO [ ] HAPANA [ ]

7. Je, huwa unakosa usingizi kutokana na msongo wa mawazo?

   NDIYO [ ] HAPANA [ ]

8. Hali hii ya msongo wa mawazo huwa inakutokea mara ngapi?
   a) Mara kwa mara
   b) Mara nyingi
   c) Mara chache
   d) Kwa nadra
   e) Haijawahi kutokea

9. Je, unapata msaada wa kutosha kutoka kwa wenzako au viongozi wako unapokuwa na msongo wa mawazo kutokana na kazi? [ ]
   a) Mara kwa mara
   b) Mara nyingi
   c) Mara chache
   d) Kwa nadra
   e) Haijawahi kutokea

10. Je, umewahi kupokea maneno yanayochochea vurugu maeneo ya kazi? [ ]
    a) Ndio, mara kwa mara
    b) Ndio, mara chache
    c) Hapana, haijawahi kutokea

**Appendix 3: English consent form**

**MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES**

**SCHOOL OF PUBLIC HEALTH AND SOCIAL SCIENCES**

**Consent form**

**THE PREVALENCE OF SPONTANEOUS ABORTION AND ASSOCIATED FACTORS AMONG HEALTHCARE WORKERS AT MUHIMBILI NATIONAL HOSPITAL IN DAR ES SALAAM, TANZANIA**

**Participation in this study**

**Purposes of the study**

To determine the prevalence of spontaneous abortion and associated factors among healthcare workers at Muhimbili National Hospital in Dar es Salaam, Tanzania

**Sponsor:** Self-Funded

**Principal investigator:** Godriver Lumbugu

**Procedure**

There is no invasive procedure for all participants.

**Risk or harm**

There is no harms or risks to participants during this study.

**Benefits**

Results obtained from this study can be incorporated by the Ministry of Health and other stakeholders into educational programs and training sessions, raising awareness among healthcare workers about potential risks, how to minimize them and promote safer practices.

**Confidentiality**

No names or information about participants were exposed or shared; instead, the study used participants' identification numbers.

**Participation and withdrawal rights**

The participants have the right to voluntarily participate in this study or withdraw from it without payment, and there are no restrictions or outcomes for withdrawing from the study.

**Contact person**

For any question or inquiry in this study, you should contact the principal investigator, who is Godriver Lumbugu, Muhimbili University of Health and Allied Sciences, P.O. Box 65001, Dar es Salaam, Tanzania, phone number +255767026091, email: godliversalvador20@gmail.com. OR Core Supervisor Dr. Ezra J. Mrema, +255683649461, email: ezrajm@yahoo.com, ezra.mrema@muhas.ac.tz OR Dr. Nahya Salim Masoud Directorate of Research and Publication, Muhimbili University of Health and Allied Sciences, P.O. Box 65001, Dar es Salaam, phone number +255222152489.

**Agreement to participate**

I have read the contents of this form and am satisfied with them, so I agree to participate in this study.

Participant signature..... Date ……

Researcher/Researcher Assistance Signature.....Date.....

**Appendix 4: Swahili Consent Form**

**CHUO KIKUU CHA AFYA NA SAYANSI SHIRIKISHI MUHIMBILI**

**SHULE YA AFYA NA SAYANSI YA JAMII**

**Fomu ya ridhaa**

**UTAFITI WA KUCHUNGUZA NA KUTATHMINI UTOKEAJI WA MIMBA KUHARIBIKA PASIPO KUTARAJIA NA VIASHIRIA VINAVYOHUSIANA AMA KUSABABISHA MIMBA KUHARIBIKA MIONGONI MWA WAFANYAKAZI WA AFYA KATIKA HOSPITALI YA TAIFA YA MUHIMBILI HUKO DAR ES SALAAM, TANZANIA**

**Utayari wa kushiriki katika utafiti huu**

**Lengo la utafiti**

Malengo ya utafiti huu ni kutathmini utokaji wa mimba pasipo kutarajia miongoni mwa wafanyakazi wa afya na viashiria vinavyohusiana na utokaji wa mimba ghafla katika Hospitali ya Taifa ya Muhimbili Dar es Salaam, Tanzania.

**Mtafiti:** Godriver Lumbugu

**Mfadhili:** UFADHILI BINAFSI

**Madhara/hasara**

Hakuna madhara au hasara zitakazomkuta mshiriki yeyote wa utafiti huu.

**Faida**

Matokeo yatakayopatikana kutokana na utafiti huu yanaweza kujumuishwa na Wizara ya Afya na wadau wengine katika programu za elimu na vikao vya mafunzo, kuongeza uelewa miongoni mwa wafanyakazi wa afya kuhusu hatari zinazoweza kutokea, jinsi ya kuzipunguza, na kukuza ufanisi katika kazi.

**Usiri**

Hakuna taarifa yoyote au majina ya mshiriki yatakayoandikwa au kutolewa kwa mtu yoyote asiye husika na taarifa zote za mshiriki ni siri baina ya mtafiti na mshiriki, zaidi mtafiti atatatumia namba ya utambulisho.

**Haki ya kushiriki au kutokushiriki**

Washiriki wote wanayo haki ya kushiriki au kutoshiriki katika utafiti huu na hakuna malipo ya kushiriki au kutoshiriki katika utafiti huu.

**Mawasiliano**

Kama una maswali zaidi kuhusu utafiti huu tafadhali wasiliana na mtafiti mkuu Godriver Lumbugu, Chuo kikuu cha Afya na Sayansi Shirikishi Muhimbili SLP 65001 Dar es Salaam, Namba ya simu +255767026091 Barua Pepe: godliversalvador20@gmail.com AU wasiliana na Msimamizi mkuu Dk Ezra J. Mrema, namba ya simu +255683649461 Barua pepe: ezrajm@yahoo.com, ezra.mrema@muhas.ac.tz AU wasiliana na Dk. Nahya Salim Masoud Kurugenzi ya Utafiti na Machapisho, Chuo kikuu cha Afya na Sayansi Shirikishi Muhimbili S.L.P. 65001 Dar es Salaam, Simu namba +55222152489.

**Ridhaa**

Nimesoma fomu hii ya ridhaa na nimeelewa yote yaliyoandikwa kwenye fomu hii na ninakubali kushiriki katika utafiti huu.

Sahihi ya Mshiriki ……. Tarehe ……..……

Sahihi ya Mtafiti/Mtafiti Msaidizi ……. Tarehe……

**Appendix 5: Ethical clearance letter**

**UNITED REPUBLIC OF TANZANIA**

MINISTRY OF EDUCATION, SCIENCE AND TECHNOLOGY

MUHIMBILI UNIVERSITY OF HEALTH AND ALLIED SCIENCES

**OFFICE OF THE DIRECTOR – RESEARCH, PUBLICATIONS AND INNOVATION**

Ref. No.DA.282/298/01.C/2211 Date: 16/05/2024

MUHAS-REC-05-2024-2211
GODRIVER LUMBUGU,
PI,
MUHAS

**RE: APPROVAL FOR ETHICAL CLEARANCE FOR A STUDY TITLED: PREVALENCE OF SPONTANEOUS ABORTION AND ASSOCIATED FACTORS AMONG HEALTH CARE WORKERS AT MUHIMBILI NATIONAL HOSPITAL IN DAR-ES SALAAM, TANZANIA.**

Reference is made to the above heading,

I am pleased to inform you that the Chairman has on behalf of the University Senate, approved ethical clearance of the above-mentioned study, on recommendations of the Senate Research and Publications Committee meeting accordance with MUHAS research policy and Tanzania regulations governing human and animal subjects research.

APPROVAL DATE: 16/05/2024
EXPIRATION DATE OF APPROVAL: 16/05/2025

**STUDY DESCRIPTION:**
**Purpose:**

The purpose of this Study is to assessing the prevalence of spontaneous abortion and associated factors among health care workers at Muhimbili national hospital in Dar-es salaam, Tanzania.

The approved protocol and procedures for this study is attached and stamped with this letter, and can be found in the link provided: https://irb.muhas.ac.tz/storage/Certificates/Certificate%20-%2015363.pdf and in the MUHAS archives.

**The PI is required to:**

1. Submit bi-annual progress reports and final report upon completion of the study.
2. Report to the IRB any unanticipated problem involving risks to subjects or others including adverse events where applicable.
3. Apply for renewal of approval of ethical clearance one (1) month prior its expiration if the study is not completed at the end of this ethical approval. You may not continue with any research activity beyond the expiration date without the approval of the IRB. Failure to receive approval for continuation before the expiration date will result in automatic termination of the approval for this study on the expiration date.
4. Obtain IRB amendment (s) approval for any changes to any aspect of this study before they can be implemented.
5. Data security is ultimately the responsibility of the investigator.
6. Apply for and obtain Data Transfer Agreement (DTA) from NIMR if data will be transferred to a foreign country.
7. Apply for and obtain Material Transfer Agreement (MTA) from NIMR, if research materials (samples) will be shipped to a foreign country.
8. Apply for and obtain permission to publish the results from National Institute for Medical Research. The application should be before submitting to a publisher and not concurrently through the email publications@nimr.or.tz.
9. Any researcher, who contravenes or fail to comply with these conditions, shall be guilty of an offence and shall be liable on conviction to a fine as per NIMR Act No. 23 of 1979, PART III section 10 (2)
10. The PI is required to ensure that the findings of the study are disseminated to relevant stake holders.
11. PI is required to be versed with necessary laws and regulatory policies that govern research in Tanzania. Some guidance is available on our website https://drp.muhas.ac.tz/.

Muhimbili University of Health and Allied Sciences
DIRECTOR
Research, Publications & Innovations

Dr. Nahya Salim Masoud,
**Chairperson, MUHAS Research and Ethics Committee**

## Appendix 6: Permission Letter to Conduct Research from Muhimbili National Hospital

THE UNITED REPUBLIC OF TANZANIA

MINISTRY OF HEALTH

**MUHIMBILI NATIONAL HOSPITAL**

*In reply please quote:*

Ref. No.: MNH/CRTCU/Perm/2024/233 Date: 31st May, 2024

Head of Department,
- Radiology
- Anaesthesia
- Pharmacy
- Medical Records

Director of Nursing and Midwifery Services
**Muhimbili National Hospital**

Kindly assist with ~~access~~ Support
04.06.2024.

**RE: PERMISSION TO COLLECT DATA AT MNH**

| | |
|---|---|
| ~~Name of Student~~ | **Godriver Lumbugu** |
| Title | **"Prevalence of Spontaneous Abortion and Associated Factors Among Healthcare Workers at MNH Dar es Salaam Tanzania"** |
| Institution | Muhimbili University of Health and Allied Sciences |
| Supervisor | Dr. Ezra Mrema (MUHAS) |
| Co – supervisors | Baldwina Tita (MNH) |
| Period | 31st May 2024 to 30th June, 2024 |

Approval has been granted to the above principal investigators to collect data at MNH. Dissemination of study findings at MNH shall be overseen by **Baldwina Tita** (MNH) supervisor.

Upanga West, Kalenga Street, Plot No. 10480/3, P.O. BOX 65000, Dar es Salaam, Tanzania.
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
Email: info@mnh.or.tz, Website: www.mnh.or.tz

Kindly ensure the named principal investigator abide to the ethical principles and other conditions of the research approval.

Sincerely,




**Mbwambila Ng'amilo**
**For: Head of Clinical Research, Training and Consultancy Unit**

c.c DMS, DICT, DCSS, DSS
c.c Baldwina Tita
c.c **Godriver Lumbugu**

Upanga West, Kalenga Street, Plot No. 10480/3, P.O. BOX 65000, Dar es Salaam, Tanzania.
Telephone: +255-22-2151367-9, Telephone: +255-22-2151351-2
Email: info@mnh.or.tz, Website: www.mnh.or.tz

## Appendix 7: Permission Letter to Pre-test research tool at Mwananyamala

**THE UNITED REPUBLIC OF TANZANIA**
***MINISTRY OF HEALTH***

Telephone Address:

Telephone: 022-2760500

Mwananyamala Regional
Referral Hospital,
P.O.Box 61665
**Dar es Salaam.**

**RE: NO.: MA. 239/240/01/99**

**DATE: 29th May,2024**

Godrover Lumbugu,
P.O.BOX 65001,
**DAR ES SALAAM.**

**RE: PERMISSION TO PRETEST RESEARCH TOOL IN MWANANYAMALA REGIONAL REFERRAL HOSPITAL**

The captioned subject refers

2. May you be informed that your request to research Titled "***Prevalence of spontaneous Abortion and Associated Factors among Healthcare workers at Mwananyamala Regional Referral Hospital - in Dar es salaam***" ***Start*** **from 29 May to June, 2024**, is asserted.

3. The Institution charges **₤50,000/=**, as Research fee as per student spent. The payments are to be made upon reporting.

4. May she report to the Administration and HR department head for further instruction.

Thanks.

For: MEDICAL OFFICER INCHARGE
MwananyamalaRegionalReferralHospital
P.O.Box 61665
DAR-ES-SALAAM

Atugonza Kyaruzi
**RESEARCH COORDINATOR**
**FOR: MEDICAL OFFICER INCHARGE**
**MWANANYAMALA REGIONAL REFERRAL HOSPITAL**

**COPY:**
Heads of Gynecology Improvement Department - **Mwananyamala Regional Referral Hospital**

**- Report to the head of Gynecology Department**

3.6.2024

Kindly accord her the necessary assistance

Dr Lwambo

**Appendix 8: Digital Receipt**

turnitin

## Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

| | |
|---|---|
| Submission author: | Godriver Lumbugu |
| Assignment title: | Research Proposal |
| Submission title: | Dissertation_Godriver |
| File name: | GODRIVER_DISSERTATION.docx |
| File size: | 856.6K |
| Page count: | 59 |
| Word count: | 11,261 |
| Character count: | 67,260 |
| Submission date: | 05-Aug-2024 02:01PM (UTC+0300) |
| Submission ID: | 2427631981 |



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**Appendix 9: Plagiarism Report**

Dissertation_Godriver

ORIGINALITY REPORT

| 20% | 14% | 9% | 11% |
|---|---|---|---|
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PRIMARY SOURCES

| | | |
|---|---|---|
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