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Doctoral Dissertation

Title:

An Education Program for Pregnant Adolescents Using Peers in Tanzania: A Quasi-Experimental Study

15DN013

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Abstract

Study Purpose: Complications during pregnancy and childbirth are the second leading cause of death for 15- to 19-year-old adolescent women globally. Limited studies have been conducted in addressing the knowledge and support needs of pregnant adolescents. The purpose of this study was to determine the effectiveness of a peer led-education program on knowledge of obstetric danger signs, social support and coping mechanisms of pregnant adolescents.

Methods: A quasi-experimental study was conducted. The study included pregnant adolescents aged 15-19, who could read and speak Swahili, and could access and use a mobile phone. The study was conducted in two randomly selected public health facilities in Tanzania. Participants in the intervention (n=26) and control group (n=24) were non-randomly chosen within each of the two facilities. The intervention group received an education program from trained peer educators and the control group received the usual care and the "*Nne na Tano"* [Four and Five] story booklet about two adolescents with very different pregnancy outcomes. Data were collected during the pretest, post-test, and follow-up test using a self-administered questionnaire for both groups.

Results: A total of 50 participants were recruited with the mean age of 18.00 (SD = 0.91). There were no statistical significant differences in the baseline characteristics of the intervention and control group. There was a statistically significant difference in the knowledge of obstetric danger signs' scores between the intervention and control group during post-test (p = <0.001). The program was successful at improving knowledge of obstetric danger signs. There was a statistically significant difference in the scores of social support (p = <0.001) with higher scores in the control than intervention group compared to the pretest. There was no statistically significant difference in coping mechanism scores between intervention and control group.

Conclusion: The study demonstrated the potential of peer-led education program on obstetric danger signs in improving knowledge of danger signs among pregnant adolescents. However, further evaluation of the effectiveness of the program is needed using a large sample before recommending program implementation in the health-care system.

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List of Abbreviations

ANC:	Antenatal care
JSPS:	Japan Society for Promotion of Science
MUHAS:	Muhimbili University of Health and Allied Sciences
RA:	Research Assistant
RCHC:	Reproductive and Child Health Clinic
UNFPA:	United Nations Population Fund
UNICEF:	United Nations International Children's Emergency Fund
WHO:	World Health Organization

Chapter 1. Introduction

I. Background

Worldwide, there are about 16 million adolescent women aged 15-19 years who give birth every year and 95% of these births are from low- and middle-income countries (WHO, 2014). Pregnancy and childbearing among adolescents bring substantial social and economic costs through immediate and long-term impacts on adolescent parents and their children (About Teen Pregnancy, 2017). Complications during pregnancy and childbirth are the second leading cause of death for 15 to 19 year-old adolescent women globally (WHO, 2014).

Young people become sexually active at an early age, when most of them have no knowledge of reproductive health and childbearing (Reina, Ciaravino, Llovera, & Castelo-Branco, 2010, UNICEF, 2011). Consequently, many pregnant adolescents become affected by a number of factors that include lack of social support, low knowledge of reproductive health, poverty, school dropout, sexual and physical abuse, and unfriendly health services (Madeni, Horiuchi & Iida, 2011; Mbelwa & Isangula, 2012; Rukundo, Abaasa, Natukunda, Ashabahebwa & Allain, 2015).

Tanzania as a low-income country, continues to have a burden of high adolescent fertility rate and maternal mortality rate (NBS and Macro, 2011). A report by UNICEF (2011) on adolescents in Tanzania has shown that young women in rural areas are almost twice as likely to start childbearing by age 19 compared to young women living in urban areas. According to the 2015-2016 Tanzania Demographic Health Survey, 27% of adolescent women aged 15-19 years have already begun childbearing and are either already mothers or pregnant with their first child. The prevalence of adolescent pregnancy in rural area (32%) is almost two times as much compared to that in urban area (19%) and is due to socioeconomic differences (MoHCDGEC, MoH, NBS, OCGS, and ICF,

2016).

Pregnancies among adolescents in a resource-constrained area are multifactorial and determined by a gender-based cultural and socioeconomic factors (Pradhan et al., 2015). Adolescents often do not seek health services because they lack knowledge on childbearing issues including obstetric danger signs, as well as receiving inappropriate care from service providers and the community. Findings show that more than 43% of pregnant adolescents give birth without professional care (UNICEF, 2011). The antenatal education that has been conducted in most public health services has not been geared into meeting specific needs of pregnant adolescents who are in high risk of having obstetric complications. This means there is an urgent need of supporting this vulnerable population of pregnant adolescents. A feasibility study of an education program on obstetric danger signs among pregnant adolescents in Tanzania shows that they also need support from peers (Mwilike, Shimoda, Oka, Shimpuku, Leshabari & Horiuchi, 2018).

Having a peer support group is important in gaining health related information and psychosocial benefits among pregnant adolescents. The adolescents tend to interact better with their peers than adults (Campbell & MacPhail, 2002). Peer education is a new area of study in Eastern Africa that is focusing towards helping pregnant adolescents who undergo a lot of social-cultural and economic challenges (Sik, 2015).

The use of peer educators has been proven to be effective in sharing health related information particularly in the areas concerning HIV/AIDS and reproductive health among adolescents (Medley, Kennedy, O'Reilly & Sweat, 2009). Peers have strong influence on each other and are assumed to be easily trusted and comfortable to share and discuss sensitive issues (Campbell & MacPhail, 2002). Also the use of peer educators is cost effective compared to the use of health professionals. The coping mechanisms towards the news of being pregnant tend to vary among adolescents. Married adolescents respond towards pregnancy and childbirth positively compared to unmarried adolescents

(Atuyambe et al., 2007, Mwilike et al., 2018). The coping mechanisms may be either problem solving strategies such as attempting abortion or help-seeking such as asking the elders or peers for help.

However, limited studies have been conducted in providing knowledge of obstetric danger signs to pregnant adolescents (Pradhan et al., 2015) using peer educators. In order to increase their knowledge on obstetric danger signs, an education program was designed to incorporate peer educators. This education program is expected to use peer educators in empowering pregnant adolescents with knowledge of obstetric danger signs and receive support from peers. Seeking help on how to cope with challenges during pregnancy is an example of problem-focused coping strategy that will be looked at. Their social support and coping mechanisms will be assessed before and after the program and the effectiveness of the program in improving knowledge of obstetric danger signs will be evaluated.

II. Statement of the problem

Knowledge of danger signs of obstetric complications is the first essential step for appropriate and timely referral to a healthcare facility (Hailu, Gebremariam & Alemseged, 2010; Kabakyenga, Östergren, Turyakira, & Pettersson, 2011; Pembe et al., 2009). However, findings from a study on knowledge of obstetric danger signs and subsequent health seeking action in Tanzania showed that adolescents have low knowledge on danger signs compared to adults (Mwilike, Nalwadda, Kagawa, Malima, Mselle & Horiuchi, 2018). Becoming pregnant leaves Tanzanian adolescent women exposed to a host of abuses and denial of many of their rights that inhibits their ability to achieve their potential as adults and leaves them feeling abandoned (Atuyambe et al., 2008; UNICEF, 2011). They may be expelled from school, rejected by their partner or families and lack social support (Hokororo et al., 2015).

Moreover, pregnant adolescents experience unfriendly treatment by health providers and this affects them from utilization of available health services that include education on obstetric danger signs (Duggan & Adejumo, 2011). Empowering adolescent with knowledge and social support will be valuable in the fight against maternal morbidity and mortality in the country.

Most studies in low-income countries have focused on predictors and prevention of adolescent pregnancy (Klima, 2003). However, to our knowledge no research that has focused at understanding the knowledge needs and providing support to pregnant adolescents. This study will be conducted to help pregnant adolescents by giving them education on obstetric danger signs and also giving them support from trained peer educators who have experienced adolescent pregnancy.

III. Purpose of the study

1) To determine the effectiveness of an education program on knowledge of obstetric danger signs among pregnant adolescents.

2) To assess the effect of peer support on coping mechanisms during pregnancy among pregnant adolescents.

3) To assess the effect of an education program on social support of pregnant adolescents.

IV. Study outcomes

Primary outcome

1. The intervention group would have higher knowledge of obstetric danger signs than the control group.
2. The intervention group will have good birth outcomes compared to the control group.

Secondary outcome

1. The intervention group would have good coping mechanisms and social support compared to control group.

V. Significance of the study

Adolescent pregnancy is a major contributor to maternal and child mortality, and to the cycle of ill health and poverty among female adolescents (WHO, 2014). Through implementation of an education program to pregnant adolescents, this study will be expected to achieve the following:

Pregnant girls and women need clear information about protecting their own health in order to have a positive birth outcome. A pregnant adolescent needs relevant knowledge concerning pregnancy and outcome and the skills, means and support to use that knowledge. Adolescents require support from family members who often make decisions about health care seeking, and the community, where a local health care provider or traditional birth attendant may teach pregnant women about warning signs in pregnancy (McIntyre, 2006). This study will therefore use experiences of peer educators in coping with pregnancy situation and the sharing of experiences from their peers will supposedly strengthen coping mechanisms during pregnancy and childbirth among pregnant adolescents. Eventually, peer support will contribute in the efforts of improving utilization of skilled health care personnel among pregnant adolescents and reducing maternal mortality.

VI. Definition of Key Terms

Knowledge of obstetric danger signs

Obstetric danger signs or warning signs indicate the presence of obstetric

complications. The warning signs of obstetric complications that may occur during pregnancy, labor and delivery and/or after delivery include: severe persistent abdominal pain; severe vaginal bleeding; convulsions or fits; loss of consciousness; high grade fever; difficulty of breathing; swelling of face, fingers and feet; headache; and or blurred vision (WHO, UNICEF, & UNFPA, 2003). In this study, the key danger signs that were addressed during pregnancy, childbirth and after delivery included the following:1) *During pregnancy*: severe vaginal bleeding, swollen hands/face, blurred vision; 2) *During childbirth*: severe vaginal bleeding, retained placenta, labor that lasts more than 12 hours, convulsions; and 3) *After delivery*: severe vaginal bleeding, high fever, foul smelling vaginal discharge.

Pregnant adolescent

The term "adolescent" is often used synonymously with "teenager". In this sense "adolescent pregnancy" means pregnancy in a woman aged 10–19 years (WHO, 2014). In this study a pregnant adolescent has been defined as a pregnant woman aged from ages 15 to 19 years.

Peer support

Peer support includes psycho-emotional support, encouragement, education and help with solving problems (Mead, Hilton & Curtis, 2001). In this study peer support has been defined as offering support by providing knowledge on obstetric danger signs, sharing pregnancy experience and building friendship and communicating with each other.

Peer educator

Peer educator is a trained person with similar age or a little bit older to other peers

and who provide education as an approach to health promotion, in which there is teaching or sharing of health information, values and behavior to others who may share similar social backgrounds or life experiences (Sriranganathan et al., 2012). In this study a peer educator has been defined as a trained mentor mother who had been pregnant when she was an adolescent and will teach obstetric danger signs and share her pregnancy and childbirth experiences.

Social support

Social support is generally defined as a range of interpersonal relationships or connections that have an impact on the individual's functioning, and generally includes support provided by individuals and by social institutions (Barker, 2007). In this study social support is defined as direct support to a pregnant adolescent in the form of emotional support, support from family, partner and her peers.

Coping mechanisms

Coping is simply defined as those strategies that are used to deal with stress. They can be problem focused or emotion focused (Garcia, 2010). Coping mechanisms are explained as strategies of how people respond when they confront difficult or stressful events in their lives (Caver et al., 2013). In this study coping mechanisms are described as emotion-focused coping strategies to overcome challenges during pregnancy.

VII. Conceptual framework

This conceptual framework has been developed following the review of relevant reports in the literature and findings from a pilot study. The central focus of this framework is to provide knowledge and peer support to pregnant adolescents. Previous studies have shown that pregnant adolescents are in great risk of maternal morbidity,

mortality and poor reproductive outcomes (Vogel, Pileggi-Castro, Chandra-Mouli, Pileggi, Souza et al., 2015; WHO, 2011). Pregnant adolescents have 1) low knowledge of obstetric danger signs, and 2) need support from their peers.

Knowledge of obstetric danger signs is the essential first step in avoiding delay in seeking appropriate and timely referral to obstetric and newborn care services (Perreira et al., 2002). A study by Atuyambe et al. (2008) found that pregnant adolescents delay in seeking healthcare. Delay can also result from the unfamiliarity of pregnant adolescents with pregnancy symptoms, obstetric danger signs, not realizing the importance of early care and emotional reactions such as guilt and fear (Bluestein & Starling, 1994). Furthermore, Rukundo et al. (2015) have identified that adolescents may not be able to access and utilize the available antenatal care services owing to lack of social support including support from peers who are experiencing the same situation.

These important factors that have been identified from the literature, can be addressed in providing support to pregnant adolescents through an educational program. Providing pregnant adolescents with information and support may eventually improve their healthcare seeking behavior and utilization of skilled care during pregnancy and childbirth. This study will introduce the education program and group peer support among pregnant adolescents. The following figure **(Figure 1)** shows the conceptual framework of this study.

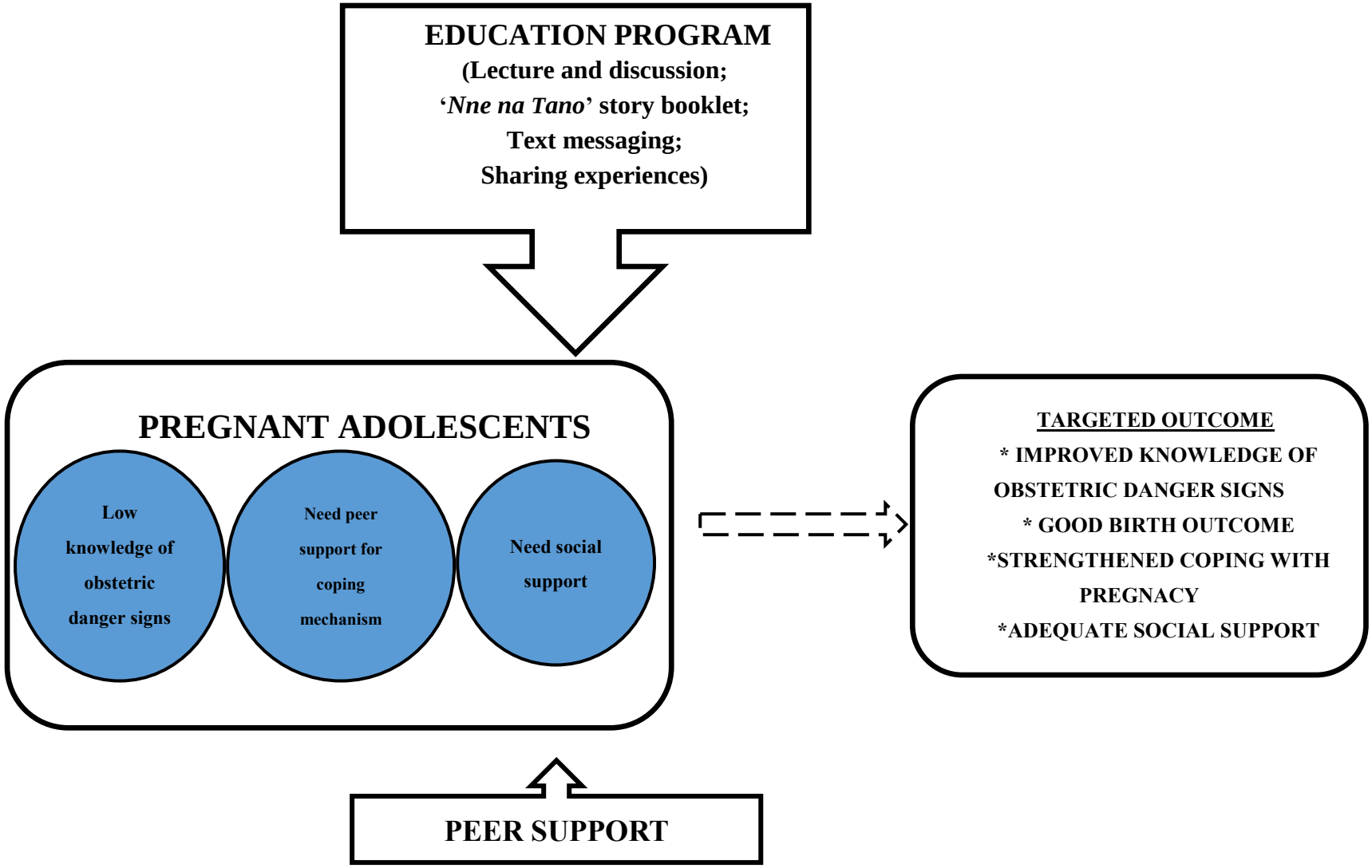

Figure 1. Conceptual framework

Chapter 2. Literature review

I. Low knowledge of obstetric danger signs

The risk of death associated with pregnancy and childbirth is about one-third higher among 15 to 19-year-old adolescent women than among 20 to 24-year-old women (Nove, Matthews, Neal & Camacho, 2014). A substantial number of youths from low-income families receive less information and have insufficient general information on reproductive health (Reina et al., 2010). Low level of education or no education are one of the most common risk factors associated with adolescent pregnancy and low knowledge on reproductive health issues (Pradhan et al, 2015).

Pregnant adolescents have low knowledge on obstetric danger signs compared to adult women and they need more consideration when providing them with care (Kabakyenga, Östergren, Turyakira, & Pettersson, 2011; Pembe et al., 2009; Rashad & Essa, 2010). Adolescent girls have limited access to information about reproductive health and lack knowledge and motivation to use available health services for themselves and their children (Aiko et al., 2014; Naigaga et al., 2015). Tanzania Demographic Health survey data documented that young mothers are slightly less likely to be informed of the obstetric danger signs than their older counterparts (NBS and Macro, 2011). However, a study by Workineh et al. (2014) on knowledge of obstetric danger signs and its associated factors in Ethiopia has shown the contrast finding concerning knowledge of obstetric danger signs that pregnant women aged 15 to 19 years were more knowledgeable than their elders.

II. Social support and coping mechanisms

Economic deprivation causes adolescent girls to engage in transactional and/or unprotected sex to meet basic needs, or to improve their living conditions (McCleary-Sills, Douglas, Rwehumbiza, Hamisi, & Mabala, 2013; UNICEF, 2011). Then, when

they become pregnant they often face stigma and social exclusion (Hokororo et al., 2015; McIntyre, 2006). The unmarried adolescent women are more vulnerable than the married ones (Atuyambe et al., 2007). Often, unmarried pregnant adolescents fear to report their pregnancy status to teachers due to the realistic anticipation of punishment, expulsion or dropping out of school and rejection. Pregnant adolescent girls may leave school because of social expectations, stigma, or because they are expelled when their pregnancy becomes known (McIntyre, 2006). Even where countries have policies to keep pregnant girls in school, social pressure may force them to leave (McIntyre, 2006).

A study in Umlazi, South Africa on social support among adolescents found that adolescent women were worried much more about disclosing their pregnancy to their parents and guardians and feared the negative reactions from family (Hill, Maman, Groves & Moodley, 2015). In addition, a study on experiences of pregnant adolescents conducted in Uganda reported that men who impregnated these young women often reject the pregnancy and deny responsibility leading to the feeling of lacking support (Atuyambe et al., 2008). Their parents reject most girls as they have added shame and an additional burden to the family. Lack of social support deny pregnant adolescents the right to receive information about danger signs during pregnancy and childbirth and they become at high risk of delaying in seeking healthcare.

Limited studies have conducted on addressing the coping mechanisms of pregnant adolescents during pregnancy and childbirth process. Adolescents cope to pregnancy and child delivery differently depending on their developmental stage (Garcia, 2010), marital status and support from their families and partner. In describing coping of adolescents, Puskar, Sereika, and Tusaie-Mumford (2003) state,

> Although coping is a process, and there is no “right or wrong” manner of coping, adolescents who used more approach and problem solving than avoidance strategies and who appraised the stressor to be a challenge were more often associated with an adaptive outcome. (p. 72).

Adolescents who have enough support from their families are likely to use problem solving and help seeking coping strategies compared to those who lack support.

III. Peer support and peer-led education

Peer support has been shown to be a need among pregnant adolescents. They believe that through peers they can easily share health related information and support each other financially and psychologically (Mwilike et al., 2018). Peer education is known as sharing of information and experiences that aims at assisting young people in developing knowledge, attitude and skills necessary establishing accessible and inexpensive preventive and psychosocial support (Abdi & Simbar, 2013). Having peer educators can be an effective way of supporting peers by imparting knowledge, offer emotional support and promote appropriate healthcare seeking behavior as they are believed to be credible source of information (Main, 2002; Sriranganathan et al., 2012).

Currently there is a limited number of peer-led education program on obstetric danger signs but several studies have been reviewed that have a similar age group of study participants and peer-led education programs. A study on the effectiveness of a peer-led HIV prevention intervention in secondary schools in Rwanda (Michielsen et al., 2012) has shown a significantly reduced stigma and limited increased knowledge in the intervention group. The study has shown that peer education program creates a more positive and less stigmatizing climate among young population.

Another study on the effects of peer-led training program on female students' self-esteem in Shiraz, Iran (Kaveh, Hesampour, Ghahremani & Tabatabaee, 2014) has shown that peer education is an effective way to promote self-esteem in adolescents as the mean scores of total self-esteem has significantly increased in the intervention group.

Chapter 3. Methods

I. Research design

The study used a quasi-experiment design. The advantage of adding a control group is to be able to minimize threats to internal validity by acquiring the baseline characteristics of participants during the pretest for both intervention and control groups. The study design is illustrated below:

Intervention group	O_1	**X**	O_2
Control group	O_1		O_2

II. Settings

This study was conducted in public health facilities located in Bagamoyo district in the Pwani region. The region is bordered to the North by the Tanga region, to the East by the Dar es Salaam region and the Indian Ocean, to the South by the Lindi region, and to the West by the Morogoro region. The total population of Pwani region is 1, 098,668. The total population of Bagamoyo district is 311,740 and female population of 157, 542 (51%) (NBS, 2013). According to the recent Tanzania demographic health survey report, Pwani region is among the regions with the high percentage of teenage childbearing (30%) compared to the national average for 27% (MoHCDGEC, MoH, NBS, OCGS, and ICF, 2016).

Generally, antenatal services are widely provided in public health services and most pregnant women can access the services easily compared to private health facilities. The antenatal services provided during antenatal visits include checking the condition of both mother and fetus, health education, HIV/AIDS counselling and testing, malaria prophylaxis, tetanus toxoid immunization and iron/folic acid supplementation. All

pregnant women including adolescents can receive these services. According to the current health scheme, there is no special care offered to pregnant adolescents. They receive antenatal services in the same manner as other women. The health education is offered in group-wise sessions during antenatal care visit.

III. Sampling

The district was purposively selected for the feasibility of reaching the study sample. The public facilities that provide antenatal services to pregnant adolescents were randomly selected by simple random sampling method. The health facility was selected from a list of all levels of health facilities available in the district. Two dispensaries were selected and one was assigned an intervention group (Facility A) while the other a control group (Facility B) using facility-based allocation.

Facility A had a total of three staffs, one clinical officer and two auxiliary nurses. The facility attends an approximate of 10 pregnant women per day, conducts an approximate of four deliveries per week and 15 deliveries per month. The top ten diseases includes upper respiratory tract infection, urinary tract infection, non-infectious gastrointestinal tract diseases, pregnancy complications, diarrhea diseases, non-severe pneumonia and malaria.

Facility B had a total of four staff, two clinical officers and two auxiliary nurses. The facility attends approximately 14 pregnant women per day, conducts about five deliveries per week and 15 deliveries per month. The top ten diseases includes upper respiratory tract infection, urinary tract infection, diarrhea diseases, pregnancy complications and malaria.

IV. Participants

Inclusion criteria: The study included a pregnant adolescent participant with the

following criteria: 1) aged between 15 to 19 years; 2) has a first time pregnancy; 3) can read and speak Swahili language and 4) can access and use mobile phone.

Exclusion criteria: It excluded pregnant adolescents with high risk pregnancies such as pre-eclampsia, gestational diabetes, and placenta previa.

V. Sample size

The sample size was determined by G power analysis method (Faul, Erdfelder, Buchner & Lang, 2009). Sample size was calculated by using the t-test pilot study results of a study on feasibility of an education program on obstetric danger signs. Therefore, the mean score and standard deviation of knowledge of danger signs for the pretest was 7.20 (SD = 2.83) and post-test 9.07 (SD = 1.67) in G power analysis, the effect size is 0.805 at a power of 80% and the probability of two-sided type 1 error of 0.05. The estimated sample size was 26 for an intervention group and 26 for a control group.

VI. Procedure

1. Duration of data collection

The data was collected from August to November 2017.

2. Measurement instruments

The pretest, posttest and follow-up test self-administered questionnaires were used to test the knowledge level before and after the intervention. The intervention group received the intervention after the pretest measurement while the control group did not receive the intervention. The questionnaires were pretested on five pregnant adolescents who were not included in any of the study groups in order to determine clarity of the questionnaires and how much time it would take to administer the tools. The measurement instruments were then refined accordingly.

The pre-test questionnaire (Appendix 1) was used to collect socio-demographic data, to assess social support, coping mechanisms and knowledge on obstetric danger signs. The post-test (Appendix 2) and follow-up (Appendix 3) questionnaires included data for social support, coping mechanisms and knowledge of obstetric danger signs. The same measurement tools were used for both intervention and control group.

1) Socio-demographic characteristics and obstetric history

This section had a total of 10 items that were developed by the researcher after review of the literature. The socio-demographic characteristics included age, marital status, education, occupation, and family structure. These factors were important to study as they influence knowledge of a pregnant woman (Pembe et al., 2009). The obstetric history that includes age at menarche, gravidity, antenatal attendance and the first day of their last normal menstrual period were determined so as to understand their reproductive characteristics before pregnancy.

2) Social support and coping mechanisms

Items about social support to pregnant adolescents were developed by the researcher and other items were modified from a previous research regarding social support and social strain measure for minority adolescent mothers (Gee & Rhodes, 2007). A total of 10 items about their social support including four reverse items were asked using 5-point Likert-type scale: (1) *strongly disagree* to (5) *strongly agree*. The total score ranges from 10-50. A higher score above 70% means adequate support from the community. The realiability coefficient (Cronbach's alpha) for social support scale was 0.73.

Items about coping mechanisms were developed as a modification from a tool by

Carver et al., 1989; Carver, 2013). The tool is named COPE inventory that measures coping skills and the items included in the study covers areas of instrumental social support, use of emotional social support and focus on and venting of emotion. There were a total of 10 items including two reverse items. Each item has a score range of 1-4: (1) *I usually don't do this at all* (2) *I usually do this a little bit* (3*) I usually do this a medium amount* and (4) *I usually do this a lot*. Higher scores above 70% means good coping mechanisms. The reliability coefficient for coping mecchanism scale was 0.71.

3) Knowledge on obstetric danger signs

This section consisted of 10 items. The items consist of key danger signs during pregnancy, during delivery, and after delivery. These items have been developed by the researcher after review of studies conducted by Kabyakenga et al., (2011) and Mbalinda et.al., (2014) in Uganda; Pembe et al., (2009) in Tanzania and Hailu, Gebremariam & Alemseged, (2010) in Ethiopia both studying knowledge of obstetric danger signs among pregnant women. Also, the tool on "Birth Preparedness and Complication Readiness: A matrix of shared responsibilities" was reviewed and the key danger signs were extracted (JHPIEGO, 2001).

The key danger signs that were looked at during pregnancy, childbirth and after delivery included the following: 1) *During pregnancy*: severe vaginal bleeding, swollen hands/face, blurred vision; 2) *During childbirth*: severe vaginal bleeding, retained placenta, labor that lasts more than 12 hours, convulsions; 3) *After delivery*: severe vaginal bleeding, high fever, foul smelling vaginal discharge. The items were scored as 1 for '*yes'* and 2 for *'no'*. If a participant circled 'yes' for an item, that indicated she was aware of a particular danger sign. The scores obtained before and after the education program were compared to evaluate knowledge gained.

4) Birth outcomes

The birth outcomes were assessed by asking the participants details about place of delivery, the condition of the baby (live or still birth) and mother (live or dead) after delivery. In case the mother (participant) had died the birth information were inquired from the family member.

3. Data collection

1) Hiring and training research assistants

The researcher identified native Tanzanian RAs as data collectors and program facilitators. Three midwives from Muhimbili University of Health and Allied Sciences School of Nursing (MUHAS- SON) who have been researchers of maternal health and midwifery for the past five years assisted in participants' recruitment, training peer educators and the education program. Three social workers who have experience in adolescent health research with seven years of experience assisted in recruitment of peer educators and follow up. The RAs were not working in the clinical area and did not have any relationship with the staff and clients in the study setting. The researcher trained the RAs and familiarized them with the research instruments to be able to assist with data collection. The training included education on the purpose and objectives of the study, procedure of data collection, and ethical consideration. The RAs were involved in interviewing the participants during the pre-test, post-test, and follow-up test. Also, the RAs trained and follow up the peer educators during the time of study.

2) Recruitment of peer educators

Recruitment of peer educators was conducted two weeks prior the recruitment of study participants to allow time for preparation and training. The researcher

announced about the post of a peer educator through the ward office announcement board for recruitment. The selection criteria of peer educators was based on a thorough review and understanding of the Standards for Peer Education Programs (UNFPA & FHI360, 2006). The inclusion criteria for the peer educators were as follows; no older than 25 years old, had been pregnant during ages 15-19 years, can read and speak fluently in Swahili language and able to interact well with other peers. The researcher and RAs conducted interviews, orientation course and training of the study materials to the selected peer educators. The orientation guide (Appendix 5) and teaching guide (Appendix 6) for the program were used during training of peer educators. A total of 11 peer educators applied and five eligible candidates who performed well in the orientation course were recruited.

3) Recruitment strategy of study participants

The researcher and RAs visited the selected district Medical officer in charge with the ethical approval letter from MUHAS to seek permission to conduct the study. Later, the researcher and RAs submitted the permission letter from the district council to the respective health facilities nursing officer in charge and explained about the study before starting data collection.

Participants were recruited at the antenatal clinic by the researcher and RAs through a convenient sampling method. The recruitment was conducted in two different health facilities at different time periods: one facility for intervention group and another facility for control group. The researcher and RAs displayed posters (Appendix 7) about the education program at the RCHC two weeks before an intervention. The researcher and RAs were present at the study sites to conduct recruitment of participants. The nurse on duty was only required to inform pregnant adolescents about the program recruitment room. The researcher and RAs explained about the study and

gave an invitation card (Appendix 8) and consent form (Appendix 4) to each participant. The participants, who voluntarily agreed to participate in the study, were required to come with their invitation card and a signed consent form on the stated date of the study.

4) Procedure of data collection

The questionnaire in Swahili language was used to collect quantitative data for both the intervention and control group. The researcher and RAs were involved in the data collection process. The participants were informed about the purpose, methods, and ethical considerations, the pretest questionnaire, and name-tags, were given to the participants in this study. After completing the questionnaire, the researcher collected the questionnaires from the RAs and sealed them in an envelope. The time required for completing pretest was 20 minutes. The time required to fill in the post-test questionnaire was 15 minutes. The follow-up questionnaire took about 15 minutes to complete. The researcher contacted each participant to give a reminder just about one week before follow-up test.

5) Program implementation

The intervention group and control group administered the pretest, post-test and follow-up test questionnaires in different periods. The intervention group received a two- day education program from trained peer educators that included: lecture and discussion, *'Nne na Tano'* [Four and Five] story booklet, about two adolescents with very different pregnancy outcomes, video and sharing their experiences. Also they communicated through text messaging during the intervention duration and just before the follow up test. The control group received usual care and *'Nne na Tano'* story booklet. The program was implemented as shown in **Figure 2**.

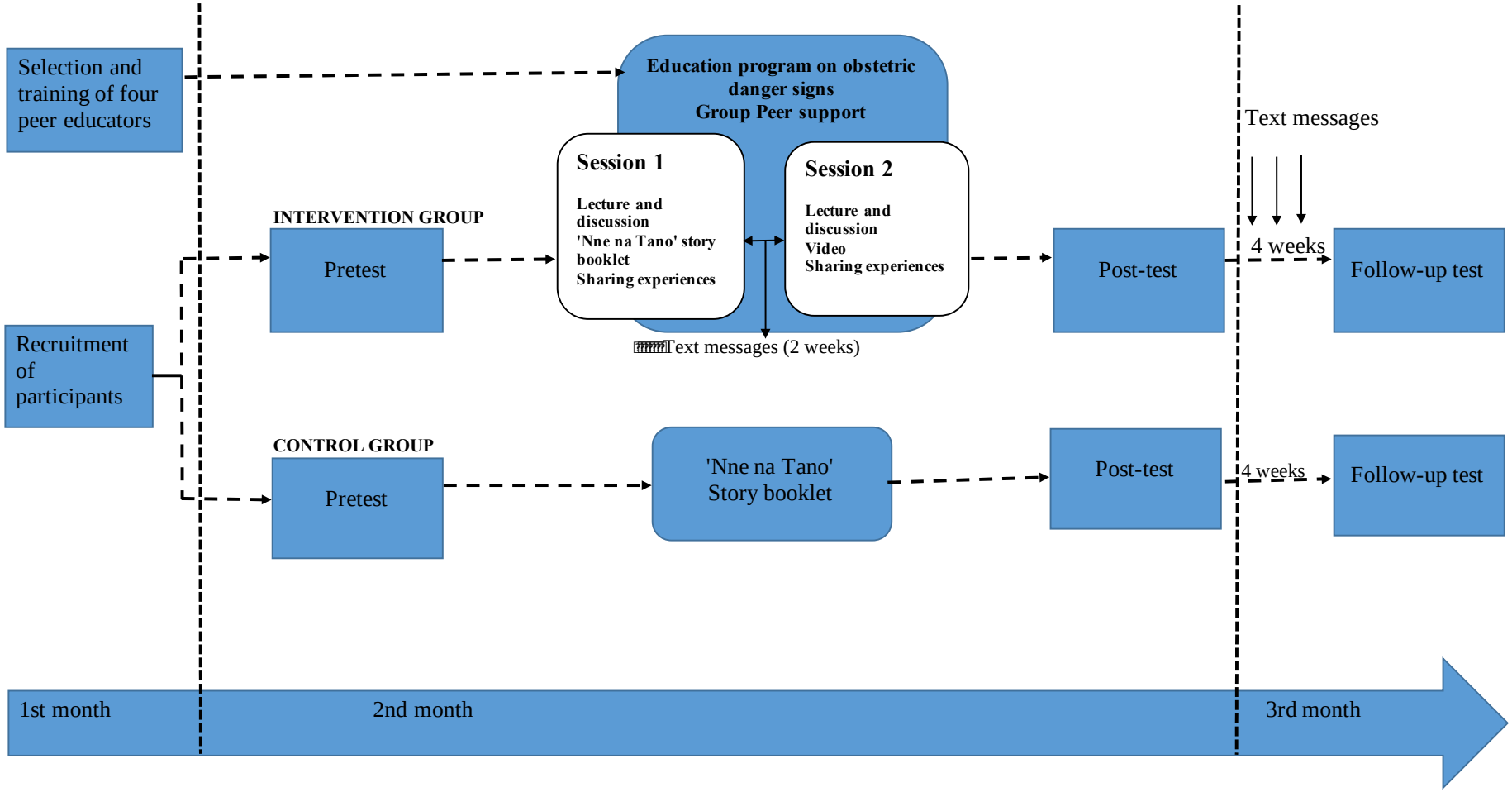

Figure 2. Intervention plan

Intervention group

The program has been developed by the researcher with the objective of improving pregnant adolescents' knowledge on obstetric danger signs and coping mechanisms. The program is named *"Nipo Nawe!"* (I am with you!), and it means a program that helps empower pregnant adolescents with information about obstetric danger signs. The contents of the program have been developed based on literature review. The short story booklet called '*Nne na Tano*' developed by Shimpuku and Madeni (2014) was used during the training (Appendix 9). The story is about two pregnant women called *Nne* and *Tano* who represented differing healthcare seeking behaviors. Participants in the intervention group participate in an education program for two sessions at an interval of two weeks.

During the first session, the participants administered a pretest questionnaire followed by lecture and discussion, reading and discussing '*Nne na Tano*' booklet, watching a video and then sharing experiences with peer educators. The program was facilitated by selected peer educators under supervision of the researcher and RA. The peer educators shared the knowledge through lecture and discussion, lead the story reading and share and discuss their pregnancy and childbirth experiences to participants.

During the second session there was lecture and discussion (**Appendix 6**), watching video and sharing experiences that was facilitated by peer educators. It was then followed by the post-test immediately after the session. The peer educators were also required to send short messages that contained some of the training materials to the participants and allowed questions from participants during the two weeks between the sessions. One month after the second session, the participants were contacted to come for the follow-up test.

Control Group

The control group received usual care. They gathered in one area within a health facility and administered a pretest. However, a '*Nne na Tano*' story book was given to each participant and they were required to return after two weeks for post-test. The researcher and RA gathered their contact information so as to send them a reminder for the post-test and tracing them. After one month from post-test they were contacted to come for a follow-up test.

A summary of the contents, methods, and evaluation for the program goal are shown in **Table 1**.

Table 1. Program Content for Each Educational Goal

Goal 1	**To improve pregnant adolescents knowledge on obstetric danger signs**
Contents	- To provide information about normal pregnancy and symptoms - To provide information on obstetric danger signs
Methods	- Lecture and discussion - Reading '*Nne na Tano*' story - Text messaging
Evaluation	- Questionnaire
Goal 2	**To strengthen coping mechanisms towards pregnancy**
Contents	- To provide information about pregnancy experiences - To provide information on coping mechanisms used by peer educators
Methods	- Sharing pregnancy experiences - Group discussion
Evaluation	- Questionnaire

VII. Data analysis

Data analysis was conducted based on the study objectives. Data were entered in Microsoft excel spreadsheet and then cleaned. After cleaning, the data were entered into the SPSS statistical package version 22 for analysis. Multiple imputation was performed to deal with missing values and increase statistical power of the study. By using SPSS five versions of data sets with imputed values were created and the fifth dataset was used. After computing, the participants with 50% or more of missing values were excluded from the analysis. A total of 96 variables were included for each participant and two participants who had 60 (66.7%) missing variables were excluded. After multiple imputation, missing values were replaced with imputed values and further analysis was carried out for 48 participants instead of 50 participants as shown in **Figure 3.**

Descriptive statistics were used to describe the quantitative data. Analysis was conducted for demographic data, social support, coping mechanisms and knowledge of danger signs. Frequencies, percentages and mean scores were computed. The statistical tests independent sample t-test, analysis of variance (ANOVA), were done to compare the intervention and control group and also to compare social demographic characteristics and other variables. The pretest, post-test and follow-up test scores for knowledge of obstetric danger signs, social support and coping mechanisms were compared between the two groups using repeated measure analysis of variance.

VIII. Ethical consideration

The study was conducted based on the principles of ethics such as harmlessness, voluntarily participation, anonymity, and protection of privacy and personal information. The following considerations were written on the participation request, and be informed to participants by the researcher/research assistants. Also, the researcher followed all the

procedure and ethical consideration of this study protocol.

1. Informed consent

The participants were given an explanation about the study and asked for their verbal consent to participate. Likewise, the participants were informed that non-participation would not influence any of their care status at the health facility. The participants were informed about the purpose, methods, benefits, risks, duration and ethical considerations by the researcher. The participation request and transportation compensation was given after participation in this study.

2. Ensuring safety of participants

The participants were informed that they did not need to answer any questions they did not want to, and they were not going to incur any physical injury or harm due to this study. The education program was going to be conducted in a safe environment within the health facility where they were comfortable to answer the questions without fear or emotional disturbance. In case a participant experienced emergency pregnancy complication during the study, the nurse midwives in the facility would be immediately contacted for care and management.

3. Protection of privacy

The participants were informed that the information they provided would be used for this study only. All the information answered on the questionnaire remained anonymous and were identified by using serial number. No names appeared on the questionnaires. The researcher and RAs explained to the participants to keep all the information shared in the group sessions confidential.

4. Data management

All the paper data of the questionnaire was managed by a researcher as electronic data using a personal computer and not in any other device. All the electronic data was kept and managed using the password-locked computer to be private and secure. Also,

all the paper data and personal information was kept in the private locked cabinet in the researcher's university and local institution in Tanzania. All the paper data will be kept at least five years and after publication is finished they will be destroyed whereas the electronic data will be deleted from the computer.

5. Approval of ethical review boards

The study gained ethical approval from: 1) the MUHAS Research and Publication Ethical committee, and 2) the Ethics Committee of St. Luke's International University with approval number 17-A001. Also, permission to conduct the study was obtained from the respective district medical officer in the study area.

Chapter 4. Results

I. Baseline characteristics

A total of 50 participants were eligible to participate in the study among 84 who were enrolled. An intervention group included 26 participants and control group included 24 participants as shown in the flow diagram in **Figure 3**. The baseline characteristics of the study participants in the intervention and control group are compared as shown in **Table 2.**

Table 2: Comparison of intervention and control group at baseline (N=50)

	Intervention	Control	
	n=26	n=24	
Variable	n (%)	n (%)	*p*-value*
Age			
<18	6 (23.1)	5 (20.8)	0.85
≥18	20 (76.9)	19 (79.2)	
Marital status			
Single	7 (26.9)	8 (33.3)	0.62
Married	19 (73.1)	16 (66.7)	
Education level			
No formal education	2 (7.7)	2 (8.3)	0.90
Primary	18 (69.2)	15 (62.5)	
Secondary	6 (23.1)	7 (29.7)	
Occupation			
Housewife	17 (65.4)	15 (62.5)	0.84
Farmer	4 (15.4)	2 (8.3)	
Small business	4 (15.4)	6 (25.0)	
Student	1 (3.8)	1 (4.2)	
Number of ANC visits			
<4 visits	19 (73.1)	19 (79.2)	0.61
≥4 visits	7 (26.9)	5 (20.8)	

*p-value <0.05

Participants at baseline had a mean age of 18.00 (SD = 0.91) in the intervention group and 18.22 (SD = 0.79) in the control group. The age range of the participants was from

16 to 19 years. Majority were married with 73.1 % in the intervention group and 66.7% in the control group. Approximately more than half (69.2%) in the intervention group and (62.5%) in the control group had primary education as their highest level of education. Most of the participants in the intervention group (65.4%) and in the control group (62.5%) were housewives. About 73.1% in intervention group and 79.2% in the control group had attended antenatal clinic less than four times. During the study period.

A chi-square test was performed to compare the intervention and control group baseline characteristics of the participants. There was no significant differences among the baseline characteristics of intervention and control groups in age, marital status, education, occupation, and number of ANC visits.

A multiple imputation method was performed to replace missing values with substituted values through SPSS statistical package. Multiple imputation has resulted into analyzing 25 participants in the intervention group and 23 participants in the control group.

Participants at baseline had a mean age of 18.00 (SD = 0.91) in the intervention group and 18.22 (SD = 0.79) in the control group. The age range of the participants was from 16 to 19 years. The majority were married with 72.0% in the intervention group and 69.6% in the control group. Most of the participants (72.0%) in the intervention group and (60.9%) in the control group had primary education as their highest level of education. More than half in the intervention group (64.0%) and in the control group (60.9%) were housewives. About 72.0% in intervention group and 78.3% in the control group had attended antenatal clinic less than four times. During the study period, majority of the participants in the intervention group (56.0%) and control group (60.9%) were in the second trimester (13-28 gestational weeks) of their pregnancy.

Table 3: Comparison of intervention and control group at baseline (N=48)

Variable	Intervention n=25 n (%)	Control n=23 n (%)	*p*-value*
Age			
<18	6 (24.0)	5 (21.7)	0.85
≥18	19 (76.0)	18 (78.3)	
Marital status			
Single	7 (28.0)	7 (30.4)	0.85
Married	18 (72.0)	16 (69.6)	
Education level			
No formal education	2 (8.0)	2 (8.7)	0.40
Primary	18 (72.0)	14 (60.9)	
Secondary	5 (20.0)	7 (30.4)	
Occupation			
Housewife	16 (64.0)	14 (60.9)	0.83
Farmer	4 (16.0)	2 (8.7)	
Small business	4 (16.0)	6 (26.1)	
Student	1 (4.0)	1 (4.3)	
Number of ANC visits			
<4 visits	18 (72.0)	18 (78.3)	0.62
≥4 visits	7 (28.0)	5 (21.7)	
Gestational age			
13-28 weeks	14 (56.0)	14 (60.9)	0.73
29-40 weeks	11 (44.0)	9 (39.1)	

*p-value ≤0.05

A chi-square test was also performed to compare the intervention and control group baseline characteristics of the participants. There was no significant differences among the baseline characteristics of intervention and control groups in age, marital status, education, occupation, number of ANC visits and gestational age as shown in **Table 3** above.

In comparing the results before and after multiple imputation, there was no significant differences in the findings.

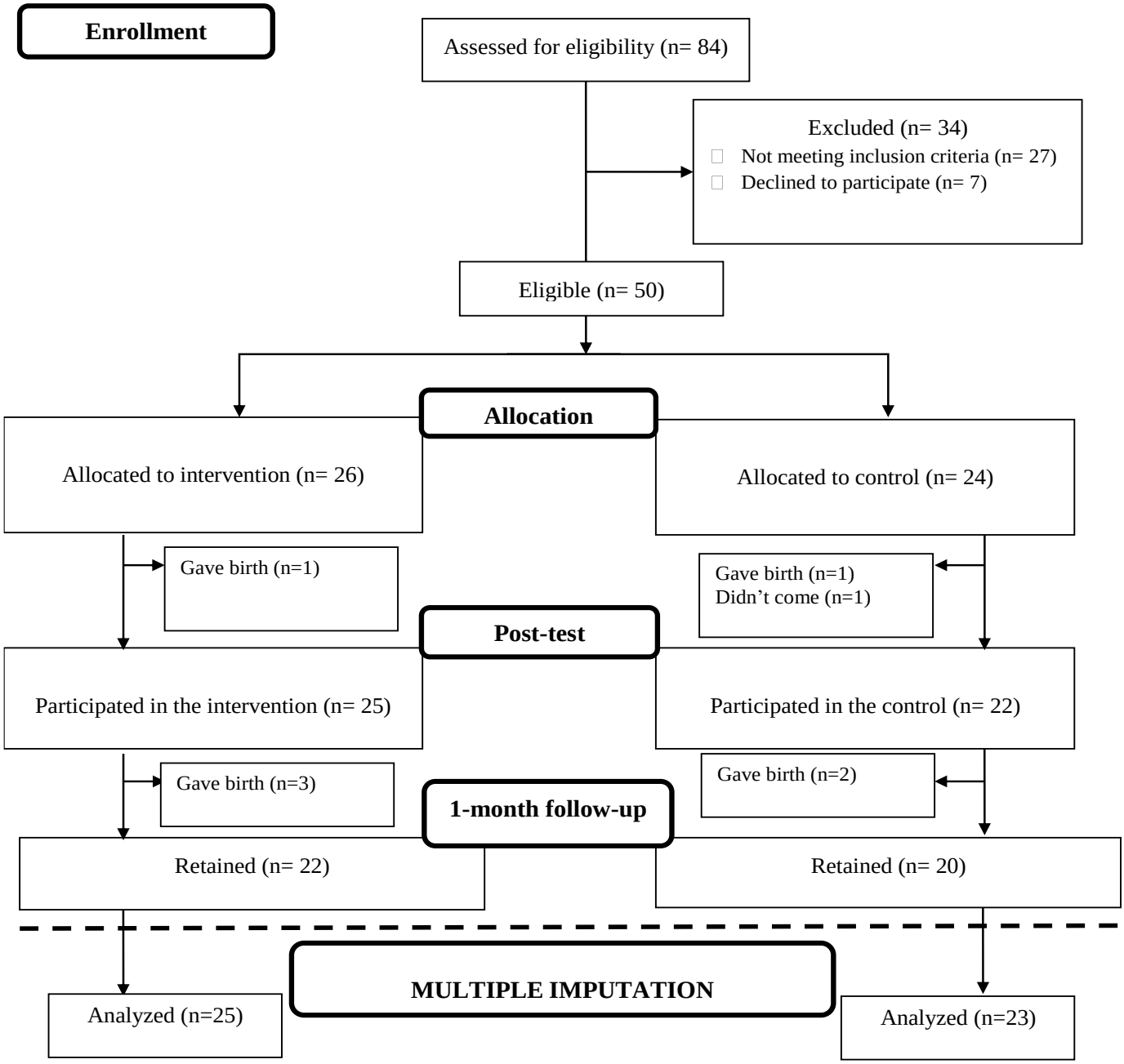

Figure 3. Flow diagram of study participants from enrolment to analysis

II. Knowledge of obstetric danger signs, social support and coping mechanisms

The independent-samples t-test was conducted to compare the mean scores on knowledge of obstetric danger signs, social support and coping mechanisms for the intervention and control groups. The results of the comparison of mean scores on the three variables for intervention and control groups during pretest, post-test and one month follow up are shown in Table 4 for complete cases before multiple imputation and in Table 5 after multiple imputation.

Table 4: Comparison of intervention and control group variables' scores (N=42)

	Intervention (n=22)	Control (n=20)		95% CI[a]		
Variable	M (SD)	M (SD)	MD[b]	Lower	Upper	*p*-value*
Knowledge on obstetric danger signs						
Pretest	6.73 (1.83)	5.30 (3.83)	1.43	-0.50	3.36	0.141
Post-test	9.55 (0.74)	5.26 (3.65)	4.28	2.50	6.06	**0.000**
Follow up	9.27 (1.08)	7.05 (3.09)	2.22	0.72	3.73	**0.006**
Social support						
Pretest	37.59 (6.08)	39.95 (4.51)	-2.36	-5.73	1.01	0.165
Post-test	37.36 (5.65)	40.84 (5.17)	-3..48	-6.89	-0.06	**0.048**
Follow up	36.18 (3.61)	40.60 (4.02)	-4.42	-6.80	-2.04	**0.001**
Coping mechanism						
Pretest	31.23 (6.06)	30.25 (5.09)	0.98	-2.54	4.49	0.577
Post-test	31.05 (6.14)	31.84 (5.19)	-0.79	-4.41	2.82	0.658
Follow up	28.05 (5.64)	30.95 (4.44)	-2.91	-6.09	0.29	0.073

[a] CI Confidence Interval;

[b]MD Mean difference;

*p-value ≤ 0.05

In Table 4 above, there was a significant difference in scores of knowledge of obstetric

danger signs at post-test for intervention (M = 9.55, SD = 0.74) and control (M = 5.26, SD = 3.65); t (39) = 5.39, p = 0.000. Also, there was a significant difference in scores at one month follow up test for intervention (M = 9.27, SD = 1.08) and control (M = 7.05, SD = 3.09); t (40) = 3.06, p = 0.006.

There was a significant difference in scores of social support at post-test for intervention (M = 37.36, SD = 5.65) and control (M = 40.84, SD = 5.17); t (39) = -2.04, p = 0.048. Also, there was a significant difference in scores at one month follow up test for intervention (M = 36.18, SD = 3.61) and control (M = 40.60, SD = 4.02); t (40) = -3.76, p = 0.001.

There was no significant difference in the scores of coping mechanisms at post-test for the intervention group (M = 31.05, SD = 6.11) and control group (M = 31.84, SD = 5.19); t (39) = -0.45, p = 0.658. Furthermore, there was no significant differences in scores at one month follow up for intervention group (M = 28.05, SD = 5.64) and control group (M = 30.95, SD = 4.44); t (40) = -1.84, p = 0.073.

Table 5: Comparison of intervention and control group variables' scores (N=48)

Variable	Intervention (n=25) M (SD)	Control (n=23) M (SD)	MD[b]	95% CI[a] Lower	Upper	*p*-value*
Knowledge on obstetric danger signs						
Pretest	6.48 (2.18)	5.22 (3.87)	1.26	-0.60	3.12	0.178
Post-test	9.60 (0.71)	5.12 (3.61)	4.48	2.90	6.06	**0.000**
Follow up	8.99 (1.35)	7.02 (2.91)	1.97	0.61	3.32	**0.006**
Social support						
Pretest	37.16 (6.46)	42.83 (4.70)	-5.67	-8.97	-2.36	**0.001**
Post-test	36.72 (6.77)	43.03 (5.72)	-6.31	-9.97	-2.65	**0.001**
Follow up	37.32 (4.64)	43.49 (4.29)	-6.17	-8.78	-3.57	**0.000**
Coping mechanism						
Pretest	30.64 (5.97)	29.30 (5.36)	1.34	-1.97	4.64	0.421
Post-test	30.52 (5.96)	31.46 (5.21)	-0.94	-4.21	2.32	0.560
Follow up	28.10 (5.33)	30.37 (4.53)	-2.27	-5.16	0.61	0.120

[a] CI Confidence Interval;

[b]MD Mean difference;

*p-value ≤ 0.05

In **Table 5** above, There was a significant difference in scores of knowledge of obstetric danger signs at post-test for intervention (M = 9.60, SD = 0.71) and control (M = 5.12, SD = 3.61); t (46) = 3.05, $p = 0.000$. Also, there was a significant difference in scores at one month follow up test for intervention (M = 8.99, SD = 1.35) and control (M = 7.02, SD = 2.91); t (46) = 6.09, $p = 0.006$. The findings suggests the effectiveness of an education program conducted on improving knowledge of obstetric danger signs.

There was a significant difference in scores of social support at pretest for

intervention (M = 37.16, SD = 6.46) and control (M = 42.83, SD = 4.70); t (46) = -3.45, p = 0.001. There was a significant difference in scores of social support at post-test for intervention (M = 36.72, SD = 6.77) and control (M = 43.03, SD = 5.72); t (46) = -3.47, p = 0.001. Also, there was a significant difference in scores at one month follow up test for intervention (M = 37.32, SD = 4.64) and control (M = 43.49, SD = 4.29); t (46) = -4.78, p = 0.000. The findings indicate a better social support in the control group compared to the intervention group.

There was no significant difference in the scores of coping mechanisms at post-test for the intervention group (M = 30.52, SD = 5.96) and control group (M = 31.46, SD = 5.21); t (46) = -0.58, p = 0.564. Furthermore, there was no significant differences in scores at one month follow up for intervention group (M = 28.10, SD = 5.33) and control group (M = 30.37, SD = 4.53); t (46) = -1.59, p = 0.120. Therefore this suggests that the program was not effective in strengthening coping mechanisms.

After comparing the results in **Table 4** (before multiple imputation) and **Table 5** (after multiple imputation), there is no major differences in the scores among the variables in the intervention and control group. However, there is a notable differences in the social support scores between the intervention and control in the two tables. During pretest, there was significant difference in the scores for social support (p = 0.001) as shown in **Table 5** while there was no significant difference in the social support scores (p = 0.165) as shown in **Table 4**.

III. Birth outcome

The birth outcome was assessed by asking the participants details about the place of delivery, the condition of the baby (live or still birth) and mother (live or dead) after delivery. Until the end of November 2017 a total of 12 participants in the intervention group had delivered a live baby and the mothers' condition was good after delivery.

Also, a total of seven participants in the control group had delivered a live baby and the mothers' condition was good. There was no maternal deaths or still births reported in either group.

IV. Knowledge of obstetric danger signs

1. Comparison of danger signs items at pretest, post-test and follow-up test

The percentage of correct answers for each danger sign item was compared at pretest, post-test and follow-up test in the intervention and control group. A repeated measure ANOVA was conducted to assess any statistical significance of each item at three different times. The findings are shown in **Table 6**.

Table 6: Comparison of correct answer on danger signs during pretest, post-test and follow-up in intervention and control group (N=48)

	Intervention (n=25)				Control (n=23)			
	Pretest	Post-test	Follow-up		Pretest	Post-test	Follow-up	
Item	n (%)	n (%)	n (%)	*p-value**	n (%)	n (%)	n (%)	*p-value**
Severe vaginal bleeding during pregnancy	17 (68.0)	23 (92.0)	24 (96.0)	**0.04**	15 (65.2)	14 (60.9)	17 (73.9)	0.52
Swollen hands/face	16 (64.0)	21 (84.0)	23 (92.0)	**0.04**	11 (47.8)	7 (30.4)	14 (60.9)	**0.03**
Blurred vision	6 (24.0)	24 (96.0)	20 (80.0)	**0.000**	8 (34.8)	10 (43.5)	16 (69.6)	**0.04**
Severe vaginal bleeding during childbirth	20 (80.0)	24 (96.0)	25 (100.0)	**0.04**	14 (60.9)	15 (60.0)	14 (60.9)	0.97
Retained placenta	16 (64.0)	25 (100.0)	21 (84.0)	**0.004**	11 (47.8)	12 (52.2)	17 (73.9)	0.20
Labor that lasts more than 12 hours	19 (76.0)	23 (92.0)	23 (92.0)	0.38	12 (52.2)	10 (43.5)	16 (69.6)	0.24
Convulsions	13 (52.0)	25 (100.0)	24 (96.0)	**0.001**	14 (60.9)	14 (60.9)	17 (73.9)	0.53
Severe vaginal bleeding after delivery	21 (84.0)	25 (100.0)	20 (80.0)	**0.03**	15 (65.2)	14 (60.9)	18 (78.3)	0.19
High fever after delivery	18 (72.0)	25 (100.0)	24 (96.0)	**0.02**	11 (47.8)	10 (43.5)	17 (73.9)	0.18
Foul smelling vaginal discharge	16 (64.0)	25 (100.0)	21 (84.0)	**0.006**	9 (39.1)	11 (47.8)	14 (60.9)	0.11

*p-value ≤ 0.05

In the intervention group, there was a statistical significant increase in the response of correct answer at pretest, post-test and follow-up in nine out of ten of the danger sign items. There was no statistical significance for the item '*Labor that lasts more than 12 hours*' (p = 0.38). However, there was a slight decrease observed between post-test and follow-up that indicates the inability to retain the knowledge gained during the intervention.

In the control group, there was a statistical significant increase in the response of correct answers for the danger sign items '*swollen hands/face*' (p = 0.03) and '*blurred vision*' (.p = 0.04). There were no statistical significant differences for eight out of ten danger signs items. There was an increase in the percentage of correct response between post-test and follow up that was observed in this group. The improvement was clearly observed between pretest and post-test for all danger sign items. Generally, there was an improvement of knowledge of obstetric danger signs in the intervention group compared to the control group.

2. Comparison of intervention and control group for each danger signs items

A chi-square test was performed to compare the intervention and control group for each danger sign item. The findings are as shown in **Table 7** below. There was no statistical significant difference for all danger sign items during pretest. There was a statistical significance difference of scores of all danger sign items during post-test between intervention and control group. There were no statistical significance differences for all danger signs during follow-up except '*severe vaginal bleeding during childbirth*' (p = 0.003) and '*high fever after delivery*' (p = 0.04).

Table 7: Comparison of intervention and control group for each danger sign item (N=48)

Item	Intervention n=25	Control n=23	*p*-value
Severe vaginal bleeding during pregnancy			
Pretest	17 (68.0)	15 (65.2)	0.84
Post-test	23 (92.0)	14 (60.9)	**0.04**
Follow-up	24 (96.0)	17 (73.9)	0.18
Swollen hands/face			
Pretest	16 (64.0)	11 (47.8)	0.26
Post-test	21 (84.0)	7 (30.4)	**0.001**
Follow-up	23 (92.0)	14 (60.9)	0.07
Blurred vision			
Pretest	6 (24.0)	8 (34.8)	0.41
Post-test	24 (96.0)	10 (43.5)	**0.000**
Follow-up	20 (80.0)	16 (69.6)	0.52
Severe vaginal bleeding during childbirth			
Pretest	20 (80.0)	14 (60.9)	0.15
Post-test	24 (96.0)	15 (60.0)	**0.01**
Follow-up	25 (100.0)	14 (60.9)	**0.003**
Retained placenta			
Pretest	16 (64.0)	11 (47.8)	0.26
Post-test	25 (100.0)	12 (52.2)	**0.000**
Follow-up	21 (84.0)	17 (73.9)	0.36
Labor that lasts more than 12 hours			
Pretest	19 (76.0)	12 (52.2)	0.09
Post-test	23 (92.0)	10 (43.5)	**0.001**
Follow-up	23 (92.0)	16 (69.6)	0.11
Convulsions			
Pretest	13 (52.0)	14 (60.9)	0.54
Post-test	25 (100.0)	14 (60.9)	**0.001**
Follow-up	24 (96.0)	17 (73.9)	0.07
Severe vaginal bleeding after delivery			
Pretest	21 (84.0)	15 (65.2)	0.13
Post-test	25 (100.0)	14 (60.9)	**0.001**
Follow-up	20 (80.0)	17 (73.9)	0.54
High fever after delivery			
Pretest	18 (72.0)	11 (47.8)	0.09
Post-test	25 (100.0)	10 (43.5)	**0.000**
Follow-up	24 (96.0)	16 (69.6)	**0.04**
Foul smelling vaginal discharge			
Pretest	16 (64.0)	9 (39.1)	0.09
Post-test	25 (100.0)	11 (47.8	**0.000**
Follow-up	21 (84.0)	14 (60.9)	0.09

V. Social support

1. Comparison of social support scores during pretest, posttest and follow-up

The social support scores were computed for each item during pretest, post-test and follow-up in the intervention and control group. The results are as shown in **Table 8** below. There was no statistically significant difference in scores during pretest, post-test and follow-up in intervention group except for one item '*my partner takes up most of my time and there is not enough time for anyone else*' ($p = 0.02$). Also, there was no statistically significant difference in scores during pretest, post-test and follow-up in the control group except for one item '*I get good support from the health worker*' ($p = 0.01$). Overall, the control group had higher mean scores during pretest, post-test and follow-up than the intervention group.

2. Comparison of intervention and control for each social support item

Each social support item was compared between the intervention and control group through an independent t-test. The results are shown in **Table 9**. There was a clear statistically significant differences between the intervention and control group for the items '*My family is always there for me*', '*I have good friends who support me'*, '*My partner takes up most of my time and there is not enough time for anyone else*' during pretest, post-test and follow-up. Also for the item '*My husband/partner helps me a lot*' there was statistically significant difference during post-test and follow-up. Furthermore, for the item '*I get good support from the health worker*' there was a statistically significant difference during pretest and post-test.

There were no statistically significant differences in the four reverse items (*I feel bad about myself or guilty and I cannot ask for help, I wish things were different so that I*

could spend time with my friends, and *I am alone most of the time*) except one item (*I feel ashamed to be seen pregnant*). The control group scored higher than the intervention group during pretest, post-test and follow-up. This suggests that the control group had higher social support than the intervention prior to the study.

Table 8: Comparison of social support scores during pretest, post-test and follow-up in intervention and control group (N=48)

	Intervention (n=25)				Control (n=23)			
Item	Pretest	Post-test	Follow-up	*p*-value	Pretest	Post-test	Follow-up	*p*-value
My family is always there for me	3.84 (1.34)	4.08 (1.11)	3.84 (1.18)	0.71	4.78 (0.42)	4.71 (0.46)	4.68 (0.52)	0.73
I have good friends who support me	3.36 (1.44)	3.64 (1.15)	3.41 (1.16)	0.57	4.22 (1.04)	4.30 (1.11)	4.10 (1.04)	0.80
My husband/partner helps me a lot	4.08 (1.35)	3.80 (1.26)	3.96 (0.93)	0.51	4.52 (0.95)	4.74 (0.69)	4.86 (0.63)	0.40
I feel bad about myself or guilty and I cannot ask for help	3.16 (1.46)	3.52 (1.23)	3.89 (0.95)	0.13	3.13 (1.79)	3.68 (1.74)	4.10 (1.19)	0.07
I get good support from the health worker	4.20 (0.82)	3.80 (1.26)	3.89 (0.75)	0.20	4.61 (0.50)	4.84 (0.36)	4.26 (1.18)	**0.01**
My partner takes up most of my time and there is not enough time for anyone else	2.80 (1.26)	3.00 (1.19)	3.48 (1.23)	**0.02**	4.74 (0.69)	4.22 (1.28)	4.65 (0.89)	0.25
I wish things were different so that I could spend time with my friends	3.80 (1.29)	3.72 (1.31)	3.71 (0.74)	0.87	4.22 (1.20)	4.09 (1.44)	4.25 (1.25)	0.92
I feel ashamed to be seen pregnant	4.16 (0.99)	3.72 (1.34)	3.71 (0.95)	0.10	4.78 (0.42)	4.35 (1.19)	4.14 (1.22)	0.07
I have good friends who have babies	3.84 (0.90)	3.64 (1.25)	3.69 (0.98)	0.65	3.78 (1.31)	4.32 (1.18)	4.54 (0.76)	0.07
I am alone most of the time	3.92 (1.15)	3.80 (1.35)	3.74 (0.97)	0.76	4.04 (1.43)	3.79 (1.53)	3.90 (1.42)	0.78

Table 9: Comparison of intervention and control group for each social support item (N=48)

Item	Intervention (n=25) M (SD)	Control (n=23) M (SD)	*p*-value
My family is always there for me			
Pretest	3.84 (1.34)	4.78 (0.42)	**0.002**
Post-test	4.08 (1.11)	4.71 (0.46)	**0.02**
Follow-up	3.84 (1.18)	4.68 (0.52)	**0.003**
I have good friends who support me			
Pretest	3.36 (1.44)	4.22 (1.04)	**0.02**
Post-test	3.64 (1.15)	4.30 (1.11)	**0.05**
Follow-up	3.41 (1.16)	4.10 (1.04)	**0.04**
My husband/partner helps me a lot			
Pretest	4.08 (1.35)	4.52 (0.95)	0.20
Post-test	3.80 (1.26)	4.74 (0.69)	**0.002**
Follow-up	3.96 (0.93)	4.86 (0.63)	**0.000**
I feel bad about myself or guilty and I cannot ask for help [a]			
Pretest	3.16 (1.46)	3.13 (1.79)	0.95
Post-test	3.52 (1.23)	3.68 (1.74)	0.72
Follow-up	3.89 (0.95)	4.10 (1.19)	0.51
I get good support from the health worker			
Pretest	4.20 (0.82)	4.61 (0.50)	**0.04**
Post-test	3.80 (1.26)	4.84 (0.36)	**0.000**
Follow-up	3.89 (0.75)	4.26 (1.18)	0.20
My partner takes up most of my time and there is not enough time for anyone else			
Pretest	2.80 (1.26)	4.74 (0.69)	**0.000**
Post-test	3.00 (1.19)	4.22 (1.28)	**0.001**
Follow-up	3.48 (1.23)	4.65 (0.89)	**0.000**
I wish things were different so that I could spend time with my friends [a]			
Pretest	3.80 (1.29)	4.22 (1.20)	0.25
Post-test	3.72 (1.31)	4.09 (1.44)	0.36
Follow-up	3.71 (0.95)	4.25 (1.25)	0.08
I feel ashamed to be seen pregnant [a]			
Pretest	4.16 (0.99)	4.78 (0.42)	**0.007**
Post-test	3.72 (1.34)	4.35 (1.19)	0.09
Follow-up	3.71 (0.95)	4.14 (1.22)	0.18
I have good friends who have babies			
Pretest	3.84 (0.90)	3.78 (1.31)	0.86
Post-test	3.64 (1.25)	4.32 (1.18)	0.06
Follow-up	3.69 (0.98)	4.54 (0.76)	**0.002**
I am alone most of the time [a]			
Pretest	3.92 (1.15)	4.04 (1.43)	0.74
Post-test	3.80 (1.35)	3.79 (1.53)	0.99
Follow-up	3.74 (0.97)	3.90 (1.42)	0.65

[a] Reverse item; p= ≤0.05

VI. Coping mechanism

1. Comparison of coping mechanism scores during pretest, posttest and follow-up

The coping mechanisms mean scores were compared during pretest, post-test and follow-up test in the intervention and control group. There were significant statistical differences in the mean scores for the items '*I discuss my feelings with someone*' (p = 0.03), '*I talk to someone who could do something concrete about my pregnancy*' (p = 0.03), and '*I get sympathy and understanding from someone*' (p = 0.03). There were no statistically significant differences in the mean scores during pretest, post-test and follow-up in all of the items in the control group. The results are shown in **Table 10**.

2. Comparison of intervention and control for each coping mechanism item

Each coping mechanism item was compared between intervention and control group. The results are shown in **Table 11**. An independent sample t-test was conducted to compare the items and there were no statistically significant differences in the mean scores of intervention and control group during pretest and posttest. There was statistically significant difference in scores during the follow-up in the items '*I discuss my feelings with someone*' (p = 0.03), '*I try to get emotional support from friends and relatives*' (p = 0.05), '*I talk to someone who could do something concrete about my pregnancy*' (p = 0.02), and '*I talk to someone about how I feel*' (p = 0.02). Overall, the control group had relatively higher mean scores than the intervention group at the one-month follow-up period.

Table 10: Comparison of coping mechanisms scores during pretest, post-test and follow-up in intervention and control group (N=48)

	Intervention (n=25)				Control (n=23)			
Item	Pretest	Post-test	Follow-up	*p*-value	Pretest	Post-test	Follow-up	*p*-value
I get upset and I let my emotions out	2.96 (1.17)	3.36 (0.99)	3.29 (1.20)	0.17	3.30 (1.15)	3.39 (0.99)	3.34 (0.94)	0.95
I try to get advice from someone about what to do	2.84 (1.25)	3.28 (0.84)	2.75 (1.18)	0.08	2.70 (1.26)	3.09 (1.28)	2.72 (1.25)	0.45
I discuss my feelings with someone	2.84 (1.18)	2.44 (1.33)	1.98 (0.97)	**0.03**	2.26 (1.32)	2.76 (1.33)	2.69 (1.19)	0.13
I talk to someone to find more about the pregnancy situation	3.32 (1.03)	3.16 (1.07)	3.10 (1.08)	0.73	3.00 (1.00)	3.00 (1.24)	3.09 (1.05)	0.85
I try to get emotional support from friends and relatives	2.80 (1.08)	2.88 (1.13)	2.48 (1.12)	0.32	3.04 (1.22)	3.36 (0.98)	3.09 (0.99)	0.25
I talk to someone who could do something concrete about my pregnancy	2.92 (1.15)	3.08 (1.19)	2.39 (1.24)	**0.03**	2.65 (1.34)	3.15 (0.99)	3.11 (0.71)	0.31
I get sympathy and understanding from someone	2.84 (1.25)	2.32 (1.28)	2.96 (1.30)	**0.03**	2.26 (1.29)	2.72 (1.30)	2.50 (1.34)	0.36
I ask people who have had similar experiences what they did	3.40 (1.04)	3.32 (0.95)	2.84 (1.14)	0.09	3.43 (0.84)	3.20 (1.09)	3.17 (0.99)	0.51
I talk to someone about how I feel	3.16 (1.07)	3.08 (1.26)	2.61 (1.23)	0.19	3.13 (1.10)	3.52 (0.85)	3.34 (0.82)	0.45
I feel a lot of emotional distress and I find myself expressing those feelings a lot	3.56 (0.96)	3.60 (0.87)	3.70 (0.73)	0.50	3.52 (0.99)	3.26 (1.21)	3.31 (1.13)	0.50

Table 11: Comparison of intervention and control group for each coping mechanism item (N=48)

Item	Intervention (n=25) M (SD)	Control (n=25) M (SD)	*p*-value
I get upset and let my emotions out [a]			
Pretest	2.96 (1.17)	3.30 (1.15)	0.31
Post-test	3.36 (0.99)	3.39 (0.99)	0.91
Follow-up	3.29 (1.20)	3.34 (0.94)	0.86
I try to get advice from someone about what to do			
Pretest	2.84 (1.25)	2.70 (1.26)	0.69
Post-test	3.28 (0.84)	3.09 (1.28)	0.54
Follow-up	2.75 (1.18)	2.72 (1.25)	0.95
I discuss my feelings with someone			
Pretest	2.84 (1.18)	2.26 (1.32)	0.12
Post-test	2.44 (1.33)	2.76 (1.33)	0.41
Follow-up	1.98 (0.97)	2.69 (1.19)	**0.03**
I talk to someone to find more about the pregnancy situation			
Pretest	3.32 (1.03)	3.00 (1.00)	0.28
Post-test	3.16 (1.07)	3.00 (1.24)	0.63
Follow-up	3.10 (1.08)	3.09 (1.05)	0.98
I try to get emotional support from friends and relatives			
Pretest	2.80 (1.08)	3.04 (1.22)	0.47
Post-test	2.88 (1.13)	3.36 (0.98)	0.12
Follow-up	2.48 (1.12)	3.09 (0.99)	**0.05**
I talk to someone who could do something concrete			
Pretest	2.92 (1.15)	2.65 (1.34)	0.46
Post-test	3.08 (1.19)	3.15 (0.99)	0.83
Follow-up	2.39 (1.24)	3.11 (0.71)	**0.02**
I get sympathy and understanding from someone			
Pretest	2.84 (1.25)	2.26 (1.29)	0.12
Post-test	2.32 (1.28)	2.72 (1.30)	0.29
Follow-up	2.96 (1.30)	2.50 (1.34)	0.23
I ask people who have had similar experiences what they did			
Pretest	3.40 (1.04)	3.43 (0.84)	0.90
Post-test	3.32 (0.95)	3.20 (1.09)	0.70
Follow-up	2.84 (1.14)	3.17 (0.99)	0.29
I talk to someone about how I feel			
Pretest	3.16 (1.07)	3.13 (1.10)	0.93
Post-test	3.08 (1.26)	3.52 (0.85)	0.16
Follow-up	2.61 (1.23)	3.34 (0.82)	**0.02**
I feel a lot of emotional distress and I find myself expressing those feelings a lot [a]			
Pretest	3.56 (0.96)	3.52 (0.99)	0.89
Post-test	3.60 (0.87)	3.26 (1.21)	0.27
Follow-up	3.70 (0.73)	3.31 (1.13)	0.16

[a] Reverse item; p= ≤0.05

VII. Comparison of socio-demographic characteristics and knowledge of danger signs, social support and coping mechanism variables

In order to test the effect of socio-demographic variables on knowledge of obstetric danger signs, social support and coping mechanisms, a two-way between-groups analysis of variance (two-way ANOVA) was computed. The following tables shows the results for comparison of each independent variable (age, marital status, education level, occupation, ANC visits, and gestational age) with knowledge of danger signs, social support and coping mechanism scores.

There were no statistically significant differences in the scores of knowledge on obstetric danger signs ($p = 0.72$), social support ($p = 0.56$) and coping mechanisms ($p = 0.35$) between the two age groups in the intervention and control group. The danger signs, social support and coping mechanism scores were higher in the ≥18 years age group than <18 years age group for both intervention and control group.

There were no statistically significant differences in the scores of knowledge on obstetric danger signs ($p = 0.10$), social support ($p = 0.07$) and coping mechanism ($p = 0.65$) between the single and married in the intervention and control groups. The social support and coping mechanism scores were higher in the married group than the single group in both intervention and control group. The knowledge scores were higher in the married than single group in the intervention.

Table 12: Comparison of education with independent variables for intervention (N=25) and control (N=23) group (post-test)

Independent Variable		≤Primary M (SD)	Post primary M (SD)	F	*p*-value
Knowledge of obstetric danger signs	Intervention	9.55 (0.76)	9.80 (0.45)	3.02	0.09
	Control	4.19 (3.66)	7.25 (2.59)		
Social support	Intervention	36.95 (7.13)	35.80 (5.72)	1.36	0.25
	Control	41.88 (5.99)	45.68 (4.33)		
Coping mechanism	Intervention	31.25 (5.32)	27.60 (8.08)	2.16	0.13
	Control	30.81 (5.61)	32.95 (4.11)		

As shown in **Table 12**, education level was recoded into participants with ≤ Primary (that include no formal education and primary) and post primary (that include secondary education). There were no statistically significant differences in the scores of knowledge of obstetric danger signs (p = 0.09), social support (p = 0.25) and coping mechanisms (p = 0.04) between those with primary or less and post primary education levels. Participants with post-primary education level have higher scores of knowledge of obstetric danger signs in both the intervention and control group. In the intervention group, participants with primary or less education level had higher scores than those with post primary education in social support and coping mechanism variables. In the control group, participants with post primary education level had higher scores than with primary or less group for all the variables.

Table 13: Comparison of gestation weeks with independent variables for intervention (N=25) and control (N=23) group (post-test)

Independent Variable		13-28 weeks M (SD)	29-40 weeks M (SD)	F	*p*-value
Knowledge of obstetric danger signs	Intervention	9.79 (0.43)	9.36 (0.92)	1.85	0.18
	Control	6.05 (3.29)	3.67 (3.78)		
Social support	Intervention	35.64 (2.98)	38.09 (7.83)	4.83	**0.03**
	Control	42.23 (4.13)	38.00 (5.03)		
Coping mechanism	Intervention	29.64 (7.08)	31.64 (4.20)	0.83	0.37
	Control	32.19 (5.30)	30.33 (5.15)		

From **Table 13** above, There was a statistically significant difference for the social support scores ($p = 0.03$) between the participants with 13-28 gestational weeks and 29-40 gestational weeks group. In the intervention group the social support scores of 29-40 gestational weeks was higher than the scores of 13-28 gestational weeks. In the control group, the social support scores of 13-28 gestational weeks was higher than the scores of 29-40 weeks. There was no statistically significant difference for knowledge of obstetric danger signs and coping mechanisms scores between the two groups by gestational age.

VIII. Feedback from peer educators

The peer educators have reported their communication with the participants to the researcher. In the study planning we expected them to communicate through text messaging. Majority of the participants in the intervention group were cooperative in communicating with peer educators through phone calls instead of text messaging. Only eight percent of the participants were not cooperative. The peer educator reported difficulties in communicating with the participant as the husband did not allow any

communication between them. The husband argues the importance of that communication and he did not want to give the participant a phone.

Chapter 5. Discussion

I. Knowledge of obstetric danger signs

The focus of this longitudinal quasi-experimental research was to investigate the impact of peer-education on knowledge of obstetric danger signs as well as on social support and coping mechanisms of pregnant adolescents in Tanzania. The findings indicated a significant difference in the knowledge of obstetric danger signs scores' between the intervention and control group during post-test and follow-up. This shows that the intervention group gained more knowledge of obstetric danger signs than the control group. We can conclude that the use of an educational program definitely resulted in the improvement of the knowledge among pregnant adolescents. Firstly, the intervention group received lectures and discussions on obstetric danger signs from peer educators and this could have contributed to the increase in awareness of obstetric danger signs. Secondly, the control group did not receive any intervention and their scores were much lower than the intervention group. Based on the researcher's experience and review of the literature, the pregnant adolescents have notable low knowledge on obstetric danger signs compared to their adult counterparts (Kabyakenga et al., 2011; Pembe et al., 2009), which corroborates the findings of the control group of this study.

Sik (2015) who explored the education, health and employment challenges of Dar-es-salaam's adolescent mothers in Tanzania, discussed the issue of pregnant adolescents facing the challenge of accessing health-related information. Inadequate health services for pregnant adolescents have prevented them from having healthy pregnancies, knowledge of danger signs and other sexual and reproductive health matters such as family planning (Sik, 2015; Atuyambe et al., 2008).

Another factor that might result in having low knowledge on obstetric danger signs is

education level. Majority of the participants had primary education as their highest level of education. The participants who had secondary education showed higher knowledge scores than those with primary education or less, although there were no significant differences between the categories (p = 0.09). This finding is similar to studies on knowledge about obstetric danger signs and associated factors in Ethiopia (Hailu & Berhe, 2014) and rural Tanzanian's women's awareness of danger signs of obstetric complications in Tanzania (Pembe et al., 2009). These studies have shown that having secondary education or higher increase the likelihood of having knowledge on obstetric danger signs than having low education level.

There is no antenatal services specifically targeting this vulnerable group of adolescents. Furthermore, there are no studies evaluating the educational program on obstetric danger signs among pregnant adolescents that could be found with which to make the comparison with our current study. In order to contribute to the efforts of reducing maternal mortality in the country, the program was designed to empower young mothers who are at higher risk of dying from obstetric complications with knowledge and support. Knowledge of obstetric danger signs will enable pregnant adolescents to identify signs of obstetric complications early and facilitate health care seeking. Therefore, this study establishes a foundation for future research in addressing the knowledge gap of this marginalized group of pregnant adolescents. In addition to that, the developed program can offer healthcare professionals and administrators an opportunity to draw up specific strategies for offering holistic health services and support that respond to special needs of pregnant adolescents.

II. Social support

The social support of pregnant was assessed through a questionnaire during pretest, post-test and social support in both intervention and control group. The control group had higher

scores during all the time periods compared to the intervention group (Table5). The family, partner and friends support was assessed in both groups but the intervention group received support from peer educators. It was assumed that having peer support would increase the feeling of social support and therefore have higher scores of social support in the intervention group. However, the findings were surprisingly different from our expectations. This might be due to non-randomization of participants.

Although our study has shown unexpected findings on social support, it also has its strengths. First, the study has addressed the issue of social support because the concept of social support cannot be ignored when dealing with pregnant adolescents. Examining social support among adolescents is crucial for understanding the support processes, perceptions, and satisfaction (Gee & Rhodes, 2007). Social support promotes successful adaptations for pregnant adolescents (Letourneau, Stewart, & Barnfather, 2004).

However, previous research on social support in pregnant and parenting adolescents by Logsdon, Birkimer, Ratterman, Cahill & Cahill, (2002) have argued that it is difficult to measure the effectiveness of an intervention on social support as the findings of our study have shown. Some of the difficulties that our study faced are small sample size, the instrument used to measure social support and within-sample variations due to developmental and socio-cultural differences not explored (Logsdon et al., 2002).

On the one hand the results from our study gave an overview of the possible availability of support from significant others upon whom a pregnant adolescent can depend during this major life transition event. Secondly, it highlights the importance of integrating the family, partner, friends, and peers in healthcare of pregnant adolescents. This is comparable to a study on the barriers to access of reproductive health care for pregnant adolescent girls by Hokororo et al. (2015), which revealed that, extending pregnant adolescents healthcare beyond antenatal clinic is necessary.

On the other hand, there is a possibility that the program design was not suited to address the dynamics of social support needs between the intervention and control group. In this study sample, the majority of pregnant adolescents received support from their parents and partners. Our study mainly focused on social interaction with peers and did not involve family and partner. Also, the time of interaction with peers was limited to two times and was not enough to draw a conclusion on the effect of a peer-led program on social support.

Another possible reason is poor cooperation of some of the participants with the peer educators during the text-messaging period. This is similar to the findings of a study on peer-mentoring for first time mothers whereby the mentor mothers experienced difficulty initiating contact with women in their study (Murphy, Cupples, Percy, Halliday & Stewart, 2008). Also, Murphy et al., (2008) found that, external influences, including family and friends, could prevent or facilitate the mentoring (in this study context peer social support). This highlights the importance of involving the family and/or partner when designing health programs for adolescents. Shimpuku et al., (2017) conducted a study in Tanzania on the perception gaps among women, husbands and family members about intentions for birthplace had found that a significant majority (81.1%) of pregnant women thought their husband decided where she would give birth and this signifies the importance of husband and family member in decision making concerning pregnancy and childbirth. Basing on these findings, the pregnant adolescents will obviously face difficulties in decision making and depend on support from their husbands and family members as decision makers. Therefore, future programs need the involvement of their husbands and family members.

In Tanzania, pregnant students are not allowed to go back to school as per government directive and this reduce the ability of receiving the minimal social support available to them. However, efforts have already started in helping pregnant adolescents who are in school in South Africa whereby a model to facilitate social support to pregnant students has been

developed by Matlala (2017). This model fosters collaborative support from family, school and healthcare providers to ensure the pregnant student remain in school and access ANC (Matlala, 2017). It is our hope that, in the near future, this model can be adopted for pregnant adolescents who are in school and offer them the needed support. Further modification of the measurement tool and intervention method needs to be done to clearly examine the patterns of social support and the outcome measured.

III. Coping mechanism

The coping mechanisms were assessed in both groups and there were no significant differences between the intervention and control group. The program used peer educators who had experienced pregnancy situation while adolescents. However, the findings have not been able to prove that using peer educators will strengthen the coping mechanisms of pregnant adolescents. However, it is important to address the coping mechanisms of pregnant adolescents. Adolescents being pregnant is a major event in their life and they tend to cope differently with it and its outcomes. Furthermore, coping with pregnancy among adolescents also depends on the social support received (Garcia, 2010). Understanding coping mechanisms of pregnant adolescents would enhance the design of healthcare provision based on their special needs.

There were no good coping mechanisms observed in the intervention group compared to the control group. This could have a number of explanations. Firstly, in this study, it was difficult to achieve the desired outcome of strengthening coping mechanisms possibly due to the limited number of contacts the participants had with the peer educators. There is a possibility that if they had a little more time together the findings would be different. Secondly, the measurement scale has not been previously used with pregnant adolescents. Possibly, the questions were not clear enough for them to understand and to explore their

coping strategies. It is advised that when assessing coping mechanism it is better for healthcare workers to provide support when completing the measurement scale. Also, there is a possibility that individual differences in coping with a pregnancy situation were not taken into consideration, and affected the findings.

To our knowledge, there are no published studies for comparison, which have evaluated the coping mechanism of pregnant adolescents after being involved in an education program. However, Myors, Johnson, and Langdon (2001) studied the coping styles of pregnant adolescents and argue that the ability of an adolescent to use pregnancy as a challenge that results in positive adjustments for her and her child may be greatly influenced by the coping mechanisms available for her. Therefore, future studies towards pregnant adolescents need to put into context both problem-focused and emotional-focused coping styles when designing an intervention.

IV. Implication for practice

The study has served as a foundation for addressing the knowledge level, social support needs, and coping mechanisms of pregnant adolescents. The findings particularly on improving knowledge of obstetric danger signs justify the effectiveness and suggest continuation and integration into the healthcare system. This study gives highlights on the areas for improvements in order to give care that focuses on the special needs of pregnant adolescents.

This research served as an initial phase following a feasibility study on an educational program on obstetric danger signs that were developed Mwilike et al., (under review). The previous study showed the feasibility of an education program and the need to create peer network support groups among pregnant adolescents. The findings of this study provides the next step in helping pregnant adolescents. They can be applied by first creating a group of

pregnant adolescents attending a particular healthcare center. Thereafter, the waiting time at the clinic can be used to provide their health education. The *Nipo Nawe* [I am with You] program can, therefore, be used during these health education sessions with pregnant adolescents. But, in consideration of scarce healthcare human resource, the idea of training volunteer peer educators and allowing them to play a role in educating pregnant adolescents is suggested.

Also, the findings suggest the need to develop appropriate scales and interventions to address complex concepts of social support and coping mechanism among pregnant adolescents. When planning social support interventions, we need to consider the content, duration, intensity, mode, level, intervention agents, and targets (Letourneau et al., 2004). After conducting larger studies on verifying the effectiveness of an education program, and addressing the difficulties in conducting this kind of project, the education program can be incorporated into the antenatal care setting and then construct strategies for offering support to this vulnerable group of pregnant adolescents.

V. Limitation of the study and further research

One main limitation of the present study is the small number of sample size and the use of only two health facilities that limited the generalization of study findings. Further studies with large sample size will be conducted after evaluating the effectiveness of an education program and findings will be generalized to the whole population. Also, since it is the first time to introduce this program to pregnant adolescents and assess their social support and coping mechanisms, additional studies are recommended to further assess these concepts among pregnant adolescents. In addition, the study was conducted in a clinical setting and in facilities located in the rural district. Therefore, the findings cannot be generalized to pregnant adolescents living in urban areas.

Furthermore, the findings of this study are limited by the possibility of bias from the study design that included non-randomly selected participants. A larger randomized control trial in future would give stronger evidence on the effectiveness of an education program. Future research is recommended particularly in issues concerning feasibility in terms of availability of resources and cost effectiveness.

Also, the use of peer educators can be further studied for longer period of time so that peer support that is cost-effective and efficient can be applied in care for pregnant adolescents. The next phase of this study can be evaluating whether the use of non-professional peers is better than using community health workers in ensuring efficacy in providing health services. In the recent years, integration of peer support in the provision of health care especially during pregnancy is an important aspect that should be taken into consideration. The study on the applicability of the education program to the setting in accordance with government policy and cultural competency is recommended.

Finally, the program duration and measurement scale of social support and coping mechanism were developed by the researcher. Although they have good reliability coefficient, further studies need to be conducted to modify and validate the tool.

Chapter 6.Conclusion

The study demonstrated the potential of the peer-led education program on obstetric danger signs in improving knowledge of danger signs among pregnant adolescents. However, it was difficult to ascertain the effect of the program on social support and coping mechanisms as there were no significant differences between the intervention and control group. Further evaluation of the effectiveness of the program is needed with a large sample size before recommendation of the program implementation in the health system.

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