

# Journal of Health, Medicine and Nursing (JHMN)

## UTILIZATION OF PRECONCEPTION CARE SERVICES AMONG COUPLES IN BUNGOMA COUNTY, KENYA

Audrey Nasenya Mukhalisi, Dr. Rosebella Iseme and Dr. Bonface  
Musila



**UTILIZATION OF PRECONCEPTION CARE SERVICES AMONG COUPLES IN BUNGOMA COUNTY, KENYA**

1\* Audrey Nasenya Mukhalisi

1Post Graduate Student: Department of Population, Reproductive Health, and Community Resource Management Kenyatta University

\*Corresponding Author's E-mail: [audreynasenya46@gmail.com](mailto:audreynasenya46@gmail.com)

2 Dr. Rosebella Iseme

Lecturer: Department of Population, Reproductive Health, and Community Resource Management Kenyatta University

3 Dr. Bonface Musila

Lecturer: Department of Obstetrics and Gynecology Kenyatta University

**Article History**

---

*Received 14<sup>th</sup> January 2022*

*Received in Revised Form 20<sup>th</sup> February 2022*

*Accepted 28<sup>th</sup> February 2022*

**Abstract**

**Purpose:** The broad objective of the study was to assess the utilization of preconception care services among couples (18-49 years) in Kanduyi Sub-County, Bungoma County, Kenya.

**Methodology:** The study used a descriptive cross-sectional study design. Both qualitative and quantitative methodologies were employed. A pre-test study was carried out in one randomly selected ward in Webuye East sub-county. Four wards in Kanduyi Sub-County were purposively selected for the study, using the Lottery random sampling method. The study participants were sampled proportionately from each ward. Data collection instruments, used by the researcher were a semi-structured, interviewer-administered questionnaire and focused group discussions. The Statistical Package for Social Sciences, version 22 was used for the descriptive analysis of the quantitative data. The quantitative results were presented using bar graphs, tables, and pie charts.

**Results:** The findings from this study have; first helped to depict a low-level of knowledge on preconception care services among couples, whereby only 41% (159) of the couples had adequate knowledge on preconception care while the rest 59% (230) had inadequate knowledge. Secondly, the utilization of preconception care services among the couples in Kanduyi sub-county in Bungoma County is very low, especially on some services. For instance, the majority 65% (251) of the couples were not screened for any medical condition and a significant proportion 61% (238) were not in any family planning program prior to conception. The socio-demographic factors that were noted to influence the utilization of preconception care services among couples include; level of education ( $p=0.029$ ), age ( $p=0.042$ ), occupation ( $p=0.030$ ), place of residence ( $p=0.002$ ) and gravidity ( $p=0.001$ ). In contrast, the sociocultural factors were partners' support (65%), traditional beliefs (81%), and church attendance (85%).

**Unique contribution to theory, practice and policy:** The Study recommends that the ministry of health and Bungoma County government should scale up education and empowerment initiatives and programs targeting the men, with the overall aim of enhancing the utilization of preconception care services by the couples. The ministry of health should integrate the various preconception health care services in all the existing reproductive health care facilities to facilitate ease of access to health care services. The ministry of health, faith-based organizations, as well as the non-governmental organizations, should develop initiatives to empower and train the couples, especially the men, on the value of preconception care services despite the prevailing traditional and cultural beliefs.

**Key words:** *Utilization, Preconception Care Services , Couples*

## 1.0 INTRODUCTION

Preconception Care (PCC) is described as health care services for all men and women, who may have an intention to conceive. In order to point out and alter behavioral, psychological, biomedical as well as, social risks to the parents' health and their future child's health. The endmost aim being, the improvement of maternal and child health results. These include; unintended pregnancies, stillbirths, maternal and child mortality, neonatal infections, preterm births, congenital disabilities, risk of type 2 diabetes, low birth weight, the transmission of HIV/STIs, and cardiovascular diseases that can develop later in life. (WHO, 2014).

Preconception health care provides essential health intervention components, such as; Education, Counselling, and Assessments. These are crucial to addressing health factors such as; substance use, domestic violence, psychosocial care, reproductive system problems, health hazards in the environment, nutrition, weight control, family planning, infectious and chronic disease conditions, and vaccinations (Ayalew *et al.*, 2017).

Preconception care, hence, provides a vital chance, for married couples, to address existing precarious health risks, which is of significant benefit to all individuals despite a plan or aspiration to conceive. This is mainly because risk factors known to impact maternal and new born health exist before the first 1000 days of life (Lassi *et al.*, 2019). Preconception health care is provided during the preconception period, which is within one year before the initiation of any unprotected sexual intercourse. (Dean *et al.*, 2016).

Worldwide, young men and women often transition into their twenties without getting regular medical check-ups. They are prone to smoking cigarettes, drinking alcohol, indulging in risky sexual behavior, and substance abuse. (Walker *et al.*, 2015). In the middle and low-income countries, sexual and reproductive health risk factors such as early marriage, unsafe sex, STIs, early pregnancy, HIV/AIDS, and childbearing are noted to account for a significant fraction of disability-adjusted years, amid the young adults. (Adesegu, 2016).

In addition, there is an interlude in the health care cycle, particularly for married couples, who often receive inadequate medical attention until their first pregnancy. Antenatal care, further, delays the possibility of lowering the dangerous effects, of health problems and health threats faced by married couples, before conception. Besides, when a pregnant woman arrives at her earliest prenatal visit, most of the vital fetal organs are already developed. The numerous health strategies that have been initiated to prevent unfavorable, infant and maternal outcomes may, therefore, delay the occurrence of the required outcome (WHO, 2015)

Globally, approximately 810 women die daily from preventable complications that may have existed before pregnancy and worsened during pregnancy. (WHO 2017) A significantly notable number of maternal deaths are reported to occur in the 20-34 years' age group, in many developing countries, majorly because this is the duration in which many married women often give birth. Therefore, preventive health interventions such as preconception health care, targeted at this cohort may most effectively reduce the number of deaths. (Ross *et al.*, 2014)

In a majority of the African countries south to the Saharan desert, despite the adoption of Sustainable Development Goal three, the maternal mortality ratio is still unacceptably high

(United Nations, 2015). Moreover, the developing regions have a disproportionately substantial burden of neonatal and maternal mortality and morbidity. The women reportedly die from pregnancy complications of childbirth such as hypertensive diseases, abortion, obstructed labor, maternal hemorrhage, and sepsis. These pregnancy complications are often due to unmanaged perilous health conditions that existed before conception that worsen during pregnancy and delivery, (Darroch *et al.*,2016; Campbell *et al.*,2016; EACLJ, 2015) The maternal mortality occurrence in Kenya is still at a significantly high level of 362 deaths for every 100,000 live births. (KDHS, 2014).

Bungoma County is among the top 15 counties with the highest maternal deaths of 266 per 100,000 live births (UNFPA, 2015), and the perinatal mortality and morbidity rates are also noted to exceed the national average. The County's neonatal mortality rate is 31 for every 1,000 live births, which is significantly above the national neonatal mortality rate of 22 for every 1,000 live births. (Gitaka, 2018). In Bungoma County, out of 47% of babies weighed at birth, approximately 5% were less than 2,500 grams. Low birth weight substantially emanates from the mother's low nutritional level and poor health before conception. (MICS, 2016). In addition, 673 of the babies were born as preterm. (Akun, 2018).

Furthermore, the number of women who go through all the ANC required visits is 50% a statistic lower than the national average of 58% (KDHS, 2015). The percentage of births attended by skilled service providers is 41.5%, a statistic that is also lower than the national figure, which is 62%. (NAYS,2015) There is also an early sexual debut at the age of 17, which is one year earlier than the national trend, and half of the adults are first married at the ages of 19 and 24, respectively. Also, 30-40% of young people engage in risky sex (AFIDEP, 2016). This risky behavior hence makes them prone to HIV/AIDS, STIs, and unintended pregnancy.

The all-inclusive, age-specific fertility rates (ASFRs) depict that childbearing starts at an early age in Bungoma County. This occurrence is because 14% of girls aged 15-19 years have begun childbearing, and specifically, 0.7% are pregnant with their first child, while 13.8% have ever given birth. Teenage pregnancy and early childbearing are among the significant factors that lead to high maternal mortality and morbidity, low birth weight, and preventable congenital disabilities. (Collins, 2016)

The ASFR for adolescents aged (15-19) is 103 births per 1,000 girls, a statistic that is significantly higher than 96 births per 1,000 girls at the national level (AFIDEP, 2016). The fertility rate increases to 219 births for every 1,000 young women aged (20-24) and further significantly elevates to a maximum of 288 for every 1,000 women aged (25-29). A notable decline occurs after that among women aged (30-49) years (MICS, 2016). The ASFRs depict that a majority of pregnancies occur within the target population of married couples aged 18-49 years.

The usual number of children per woman in Bungoma County is five, which is also a statistic that is higher than the national number of 3.9 per woman. Moreover, the proportion of married women using contraception in the County is 55.5%, which is a statistic that is lower than 58% at the national level (NCPD, 2017). The Western Province also has a huge burden of non-communicable diseases, with the prevalence of diabetes mellitus being 9% while Kenya's overall

prevalence is 5%, a significantly lower percentage. These diseases, such as diabetes and hypertension, should be diagnosed as well as controlled before a woman conceives since they often complicate pregnancy and lead to unfortunate severe effects on the pregnancy outcome (Gatsi, 2018).

Maternal diseases, such as diabetes and hypertension, often lead to the occurrence of preterm births. (WHO, 2018). A study by Namarome (2016) also indicates that pre-eclampsia is a leading obstetric complication in the Bungoma County Referral Hospital. The main health problems facing the people in the County are; drug and substance abuse, STIs, GBV, teenage pregnancy, and early marriages. (NCPD, 2017). These are health components, that may be addressed before conception and may potentially lead to an improvement of the county maternal and child health outcomes.

### **Conceptual Framework.**

The conceptual framework was adopted from the socio-behavioral model advanced by (Andersen 2014) and collated from the literature review. The model framework looked at the predisposing characteristics and enabling resources as the major factors for the utilization of preconception care.

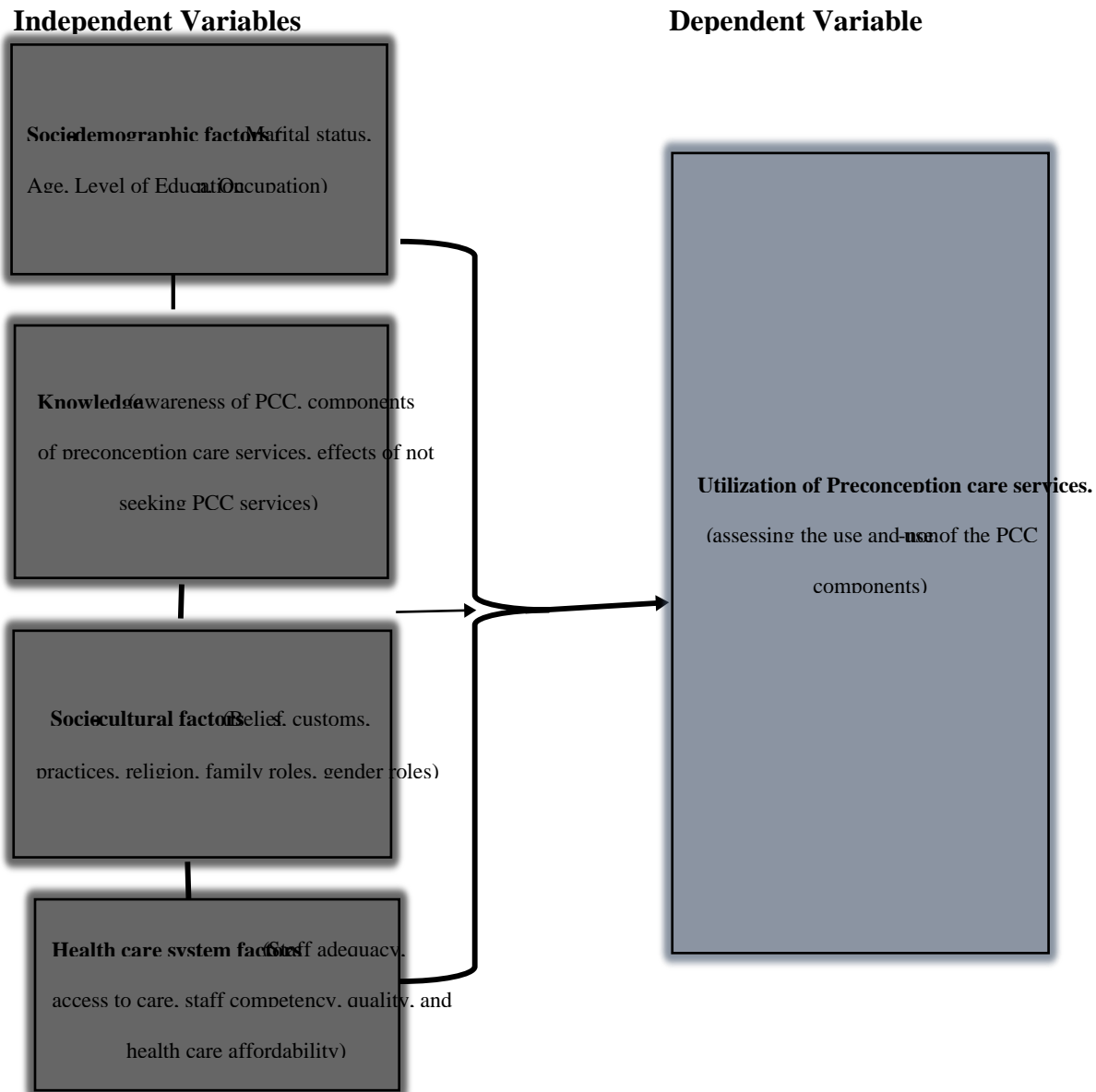


Figure 1: The conceptual framework of the study. (Andersen,2014)

## 2.0 METHODOLOGY

The study used a descriptive cross-sectional study design. Both qualitative and quantitative methodologies were employed. A pre-test study was carried out in one randomly selected ward in Webuye East sub-county. Four wards in Kanduyi Sub-County were purposively selected for the study, using the Lottery random sampling method. The study participants were sampled proportionately from each ward. Data collection instruments, used by the researcher were a semi-

structured, interviewer-administered questionnaire and focused group discussions. The Statistical Package for Social Sciences, version 22 was used for the descriptive analysis of the quantitative data. The quantitative results were presented using bar graphs, tables, and pie charts. Chi-square tests were used for testing variable associations at a 95% confidence interval, and pvalues of less than 0.05 were considered to be significant. Thematic analysis of qualitative data was carried out, and results presented as narrations or quotes.

### **3.0 RESULTS**

#### **3.1 Socio-demographic characteristics of participants.**

The study revealed that approximately 78 (20.1%) of the couples were aged 18-24, 157 (40.4%) of the couples were within the age of 25-34 years, and 154 (39.6%) were aged 35-49 years. Majority of the males 67 (42.9%) were between 35-49 years of age, while the females 100 (42.9%) were between the age of 25-34 years. Concerning the couple's level of education, about one third 133 (34.2%) had primary education while majority 168 (43.2%) had secondary education, 18(4.6%) had no formal education, and 70 (18%) had tertiary education. The males had high percentages in all levels of education with both genders recording high percentage of those having secondary education 73 (46.8%) and 95 (40.8%) for males and females respectively.

More than half of 205 (52.7%) were self-employed by occupation, with a third 130 (33.4%) of the participants being unemployed and 54 (13.9%) employed. The study shows that majority of the males 82 (52.6%) and females 123 (52.8%) were self-employed. Further, the study revealed that 66 (42.3%) of the males were unemployed. Almost three-quarters 287 (73.8%) of the participants resided in rural areas, while 102 (26.2%) lived in the urban area. A large number of the couples, 355 (91.3%) were Christians, while 34 (8.7%) were Non-Christians as represented in table 1 below:



**Table 1: Socio-demographic characteristics of participants.**

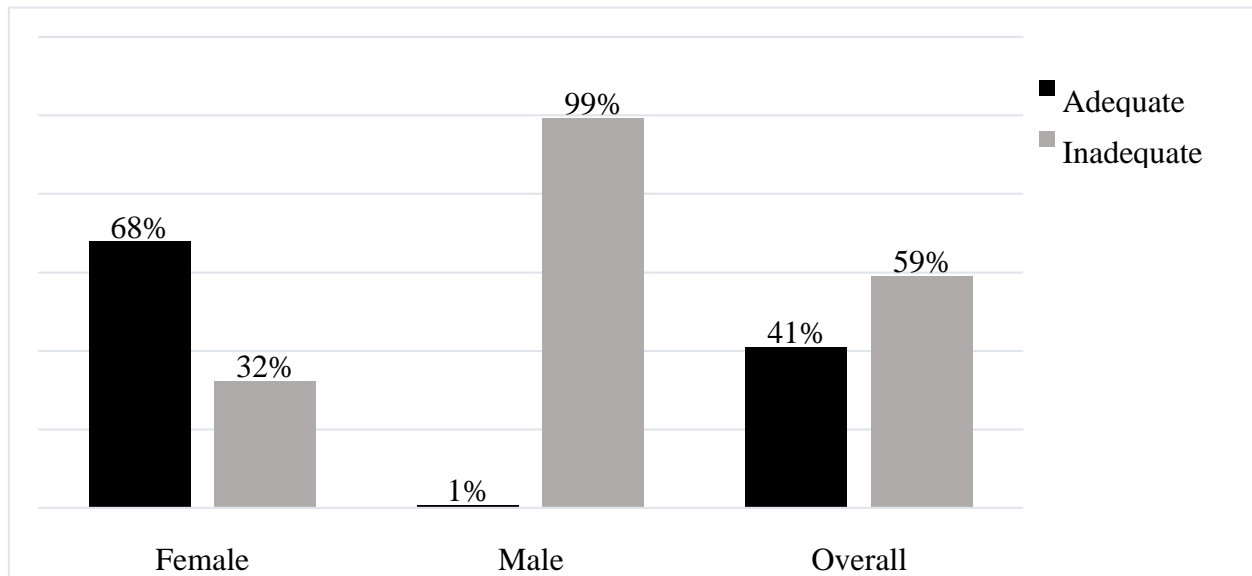
| Variable           | Category            | Female (N = 233) |             | Male (N = 156) |             | Total (N = 389) |             |
|--------------------|---------------------|------------------|-------------|----------------|-------------|-----------------|-------------|
|                    |                     | Freq.            | Percent (%) | Freq.          | Percent (%) | Freq.           | Percent (%) |
| Age                | 18 – 24             | 46               | 19.7        | 32             | 20.5        | 78              | 20.1        |
|                    | 25 – 34             | 100              | 42.9        | 57             | 36.5        | 157             | 40.4        |
|                    | 35 – 49             | 87               | 37.3        | 67             | 42.9        | 154             | 39.6        |
| Education          | No formal education | 5                | 2.1         | 13             | 8.3         | 18              | 4.6         |
|                    | Primary             | 77               | 33.0        | 56             | 35.9        | 133             | 34.2        |
|                    | Secondary           | 95               | 40.8        | 73             | 46.8        | 168             | 43.2        |
|                    | College/Tertiary    | 46               | 19.7        | 32             | 20.5        | 78              | 20.1        |
| Religion           | Christian           | 220              | 94.4        | 135            | 86.5        | 355             | 91.3        |
|                    | Non-Christians      | 13               | 5.6         | 21             | 13.5        | 34              | 8.7         |
| Occupation         | Employed            | 46               | 19.7        | 8              | 5.1         | 54              | 13.9        |
|                    | Self Employed       | 123              | 52.8        | 82             | 52.6        | 205             | 52.7        |
|                    | Unemployed          | 64               | 27.5        | 66             | 42.3        | 130             | 33.4        |
| Place of Residence | Rural               | 184              | 79.0        | 103            | 66.0        | 287             | 73.8        |
|                    | Urban               | 49               | 21.0        | 53             | 34.0        | 102             | 26.2        |

### 3.2 Knowledge on preconception Care.

The couple's level of knowledge on preconception health care was assessed based on the study participant's correct response of 11 knowledge statements assessing their knowledge on PCC. Those who scored a 'yes' earned a correct point while those who scored a 'No' earned zero points.

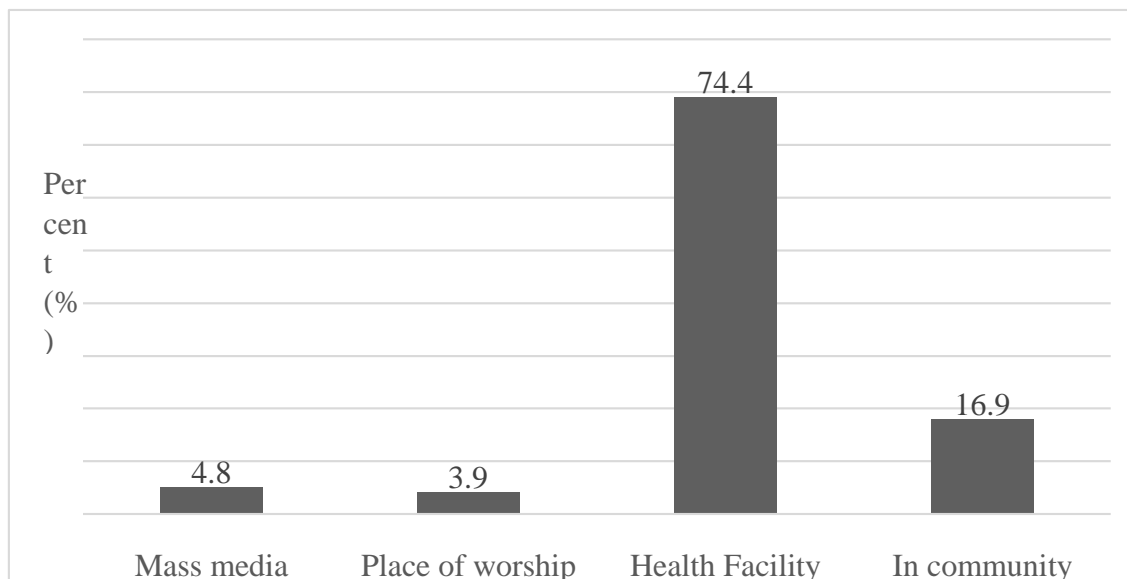
The couples who scored 6-11 points on the knowledge statements were labeled as couples with "adequate PCC knowledge," while those who scored 0-5 points were labeled as couples with "inadequate PCC knowledge." In this study, only 41% (159) of the couples had adequate knowledge on preconception care while the rest 59% (230) had inadequate knowledge as described in Figure 2 below: The study revealed that 158 (68%) of women had adequate knowledge of PCC compared to at most 1% of males, Figure 2 below:





**Figure 2: Level of knowledge on preconception care.**

The study revealed that more than half 207 (53.2%) of the couples, especially the women, were aware of preconception care services. In comparison, 182 (46.8%) of the couples, mainly the men, were not aware of PCC services. Among those couples who were aware of the PCC services, the primary source of information was from health facilities 154 (74.4%), their place of worship 8 (3.9%), mass media 10 (4.8%) and in the community 35 (16.9%) as described in Figure 3 below:



**Figure 3: Source of information on preconception care services among couples.**

Further, the couples were asked about the expected outcomes if they did not seek preconception care services. Infertility 151 (91.5%), preterm labor and birth 149 (88.7%) and developmental delays 131(89.7%) were the most known outcomes, while congenital anomalies 85 (73.3%), and fetal alcohol syndrome 83 (79.0%) were the least known outcomes, as shown in Table 2 below: The men recorded low percentages in all effects compared to the women apart from the developmental delays which they had 97.9% compared to their women counterparts who had 85.7% as shown in Table 2 below:

**Table 2 Effects of not seeking preconception care services.**

| Effect                  | Female |             | Male  |             | Total |             |
|-------------------------|--------|-------------|-------|-------------|-------|-------------|
|                         | Freq.  | Percent (%) | Freq. | Percent (%) | Freq. | Percent (%) |
| Congenital anomalies    | 64     | 81.0        | 21    | 56.8        | 85    | 73.3        |
| Preterm labor and birth | 111    | 90.2        | 38    | 84.4        | 149   | 88.7        |
| Infertility             | 105    | 92.1        | 46    | 90.2        | 151   | 91.5        |
| Developmental delays    | 84     | 85.7        | 47    | 97.9        | 131   | 89.7        |
| Fetal alcohol syndrome  | 58     | 82.9        | 25    | 71.4        | 83    | 79.0        |

### 3.2.1 Components of preconception care services.

The couples were asked to identify the various components of preconception care services namely; family planning, vaccination, screening for medical conditions, infectious diseases, nutritional and environmental conditions, education and counseling on substance use and lifestyle changes, and family history. Table 3 below shows that the most commonly known component by the couples was family planning 335 (86.1%), whereas the least known was occupational history (i.e., exposure to chemicals) 57 (14.7 %). The study shows that men had low percentages in all components compared to women, with high percentage in family planning 114 (73.1%). It's worth noting that 10 (4.3%) of the women and 40 (25.6%) of the men could not identify any of the components.

**Table 3: Components of preconception care services.**

| Component  | Female (N = 233) |             | Male (N = 156) |             | Total (N = 389) |             |
|--|------------------|-------------|----------------|-------------|-----------------|-------------|
|  | Freq.            | Percent (%) | Freq.          | Percent (%) | Freq.           | Percent (%) |
| Family Planning  | 221              | 94.8        | 114            | 73.1        | 335             | 86.1        |
| Vaccination, e.g., rubella, tetanus  | 183              | 78.5        | 81             | 51.9        | 264             | 67.9        |
| Screening for medical conditions, e.g., BP, diabetes, epilepsy, asthma                   | 173              | 74.2        | 66             | 42.3        | 239             | 61.4        |
| Education and counselling on Substance abuse, e.g., drinking alcohol, smoking cigarettes | 185              | 79.4        | 80             | 51.3        | 265             | 68.1        |
| Education and counselling on lifestyle changes, e.g., exercise                           | 149              | 63.9        | 11             | 7.1         | 160             | 41.1        |
| Nutrition Screening, e.g., diet, healthy weight, folic acid supplementation,             | 168              | 72.1        | 22             | 14.1        | 190             | 48.8        |
| Screening for infectious diseases, e.g., syphilis, HIV, gonorrhoea                       | 167              | 71.7        | 71             | 45.5        | 238             | 61.2        |
| Family history, e.g., sickle-cell anaemia  | 69               | 29.6        | 3              | 1.9         | 72              | 18.5        |
| Occupational history, e.g., the type of work   | 45               | 19.3        | 12             | 7.7         | 57              | 14.7        |
| Environmental screening, e.g., exposure to chemicals, radiation                          | 40               | 17.2        | 21             | 13.5        | 61              | 15.7        |
| None   | 10               | 4.3         | 40             | 25.6        | 50              | 12.9        |

### 3.2.2 Knowledge level on preconception care against socio-demographic characteristics.

In the test for the association between level of knowledge and selected socio-demographic characteristics, a Chi-square test was performed at a 95% level of confidence and statistical significance at 0.05 (i.e., p-value < 0.05).

The study revealed a significant statistical relationship between gender ( $p < 0.001$ ), age ( $p = 0.040$ ), level of education ( $p = 0.028$ ), occupation ( $p = 0.012$ ), place of residence ( $p = 0.023$ ), gravidity ( $p = 0.004$ ) and the utilization of preconception care services as shown in the Table 4 below:

**Table 4: Association between knowledge of preconception care and the couple's sociodemographic characteristics.**

| Independent variables |                  | Dependent variable Level of knowledge on PCC |                    | Statistical significance                 |
|-----------------------|------------------|--|--------------------|--|
|                       |                  | Inadequate (n = 230)                         | Adequate (n = 159) |  |
| Gender                | Female           | 75 (32.6%)                                   | 158 (99.4%)        | $\chi^2 = 174.445$ df= 1 p-value < 0.001 |
|                       | Male             | 155 (67.4%)                                  | 1 (0.6%)           |  |
| Age                   | 25 and Below     | 41 (17.8%)                                   | 37 (23.3%)         | $\chi^2 = 6.453$ df= 1 p-value= 0.040    |
|                       | 26 – 34          | 86 (37.4%)                                   | 71 (44.7%)         |  |
|                       | 35 and Above     | 103 (44.8%)                                  | 51 (32.1%)         |  |
| Education             | Not Schooled     | 13 (5.7%)                                    | 5 (3.1%)           | $\chi^2 = 9.109$ df= 3 p-value = 0.028   |
|                       | Primary          | 79 (34.3%)                                   | 54 (34.0%)         |  |
|                       | Secondary        | 107 (46.5%)                                  | 61 (38.4%)         |  |
|                       | College/Tertiary | 31 (13.5%)                                   | 39 (24.5%)         |  |
| Religion              | Christian        | 207 (90.0%)                                  | 148 (93.1%)        | $\chi^2 = 1.119$ df= 1 p-value= 0.290    |
|                       | Muslim           | 23 (10.0%)                                   | 11 (6.9%)          |  |
| Occupation            | Employed         | 22 (9.6%)                                    | 32 (20.1%)         | $\chi^2 = 8.856$ df = 2 p-value= 0.012   |
|                       | Self Employed    | 126 (54.8%)                                  | 79 (49.7%)         |  |
|                       | Unemployed       | 82 (35.7%)                                   | 48 (30.2%)         |  |
| Place of residence    | Rural            | 160 (69.6%)                                  | 127 (79.9%)        | $\chi^2 = 5.165$ df= 1 p-value= 0.023    |
|                       | Urban            | 70 (30.4%)                                   | 32 (20.1%)         |  |
| Gravidity             | None             | 6 (2.6%)                                     | 10 (6.3%)          | $\chi^2 = 13.449$ df = 3 p-value= 0.004  |
|                       | 1-2              | 60 (26.1%)                                   | 61 (38.4%)         |  |
|                       | 3-4              | 104 (45.2%)                                  | 64 (40.3%)         |  |
|                       | 5+               | 60 (26.1%)                                   | 24 (15.3%)         |  |

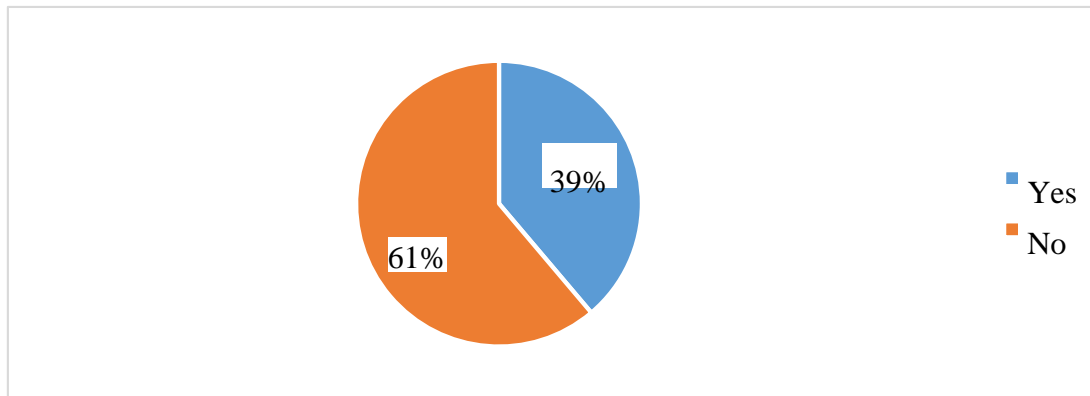
### 3.3 Utilization of preconception care services among couples.

The level of utilization of the preconception care service among the couples was determined by assessing whether the couples received any treatment, advice or lifestyle changes regarding preconception care components at least once before conception. In this study, the assessed

preconception care components were family planning, immunization of tetanus, use of folic acid, screening of medical conditions, and weight monitoring.

### 3.3.1 Utilization of family planning services.

Family planning services are crucial for the universal adoption of preconception care because they encourage pregnancy planning, and the inclusion of counseling during family planning sessions helps understand the merits of preconception care. The study showed that there was a low uptake 39% (151) of family planning services prior to the last pregnancy as shown in Figure 4 below;



**Figure 4: Family planning utilization among couples.**

The statistical analysis on the association between utilization of family planning services before conception with socio-demographic characteristics among couples revealed statistical significance with gender ( $p=0.001$ ), age ( $p= 0.045$ ), occupation ( $p= 0.030$ ) and place of residence ( $p= 0.026$ ) as indicated in Table 5 below;

**Table 5 Association between family planning services before conception with socio-demographic characteristics (N=389).**

| Independent variables |                  | Dependent variable Utilization of family planning |               | Statistical significance                |
|-----------------------|------------------|---|---------------|---|
|                       |                  | No (n = 238)                                      | Yes (n = 151) |   |
| Gender                | Female           | 117 (49.2)  | 116 (76.8)    | $\chi^2 = 30.544$ df =1 p-value = 0.001 |
|                       | Male             | 121 (50.8)  | 35 (23.2)     |   |
| Age                   | 25 and Below     | 57 (23.9%)  | 21 (13.9%)    | $\chi^2 = 5.955$ df =2 p-value= 0.045   |
|                       | 26 – 34          | 93 (39.1%)  | 64 (42.4%)    |   |
|                       | 35 and Above     | 88 (37.0%)  | 66 (43.7%)    |   |
| Education             | Not Schooled     | 9 (3.8%)  | 9 (6.0%)      | $\chi^2 = 2.295$ df= 3 p-value= 0.514   |
|                       | Primary          | 79 (33.2%)  | 54 (35.8%)    |   |
|                       | Secondary        | 109 (45.8%)                                       | 59 (39.1%)    |   |
|                       | College/Tertiary | 41 (17.2%)  | 29 (19.2%)    |   |
| Religion              | Christian        | 214 (89.9%)                                       | 141 (93.4%)   | $\chi^2 = 1.388$ df= 1 p-value =0.239   |
|                       | Non-Christians   | 24 (10.1)   | 10 (6.6%)     |   |
| Occupation            | Employed         | 25 (10.5%)  | 29 (19.2%)    | $\chi^2 = 6.999$ df= 2 p-value= 0.030   |
|                       | Self Employed    | 135 (56.7%)                                       | 70 (46.4%)    |   |
|                       | Unemployed       | 78 (32.8%)  | 52 (34.4%)    |   |
| Place of residence    | Rural            | 185 (77.7%)                                       | 102 (67.5%)   | $\chi^2 = 4.950$ df= 1 p-value 0.026    |
|                       | Urban            | 53 (22.3%)  | 49 (32.5%)    |   |
| Gravidity             | None             | 11 (4.6%)   | 5 (3.3%)      | $\chi^2 = 1.509$ df =3 p-value= 0.680   |
|                       | 1-2              | 75 (31.5%)  | 46 (30.5%)    |   |
|                       | 3-4              | 105 (44.1%)                                       | 63 (41.7%)    |   |
|                       | 5+               | 47 (19.7%)  | 37 (24.5%)    |   |

### 3.3.2 Utilization of tetanus immunization.

In this study, a majority 138 (92%) of the women had a tetanus vaccination before conception. The study revealed that utilization of tetanus immunization had a statistically significant association with the couples' gravidity ( $p=0.024$ ), place of residence ( $p=0.014$ ), level of education ( $p=0.049$ ) and gender ( $p=0.001$ ) as indicated in table 6 below;

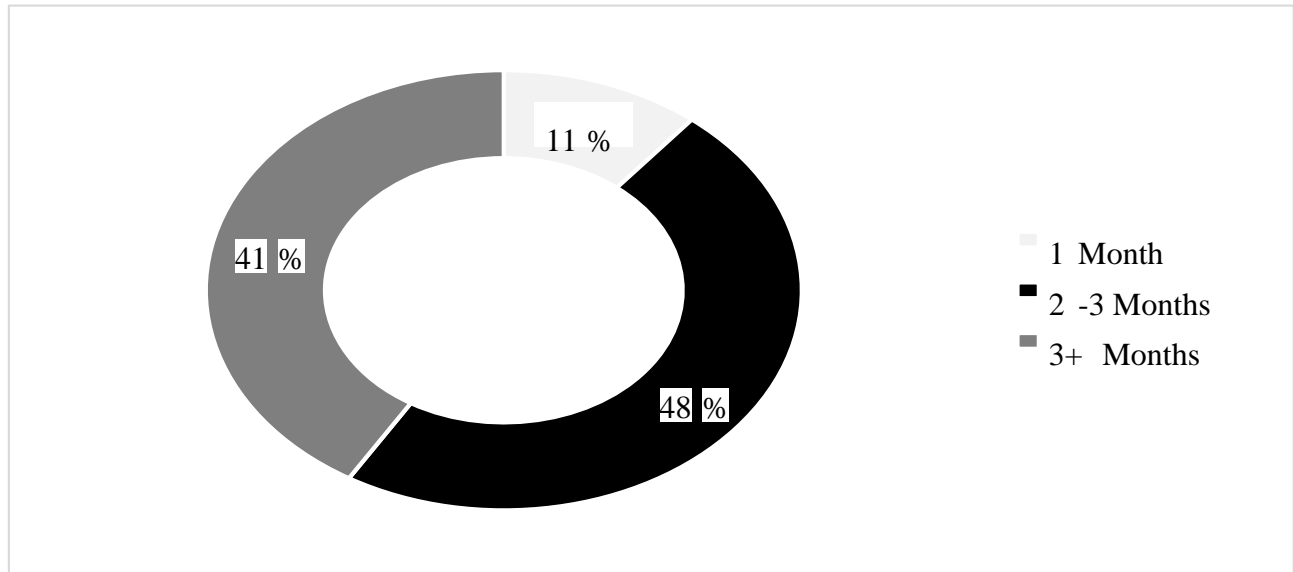
**Table 6: Association between utilization of tetanus immunization with socio-demographic characteristics.**

| Independent variables |                  | Dependent variable<br>Utilization of tetanus immunization |                  | Statistical significance                  |
|-----------------------|------------------|---|------------------|---|
|                       |                  | No<br>(n =239 )   | Yes (n<br>=150 ) |   |
| Gender                | Female           | 95 (39.7%)  | 138 (92.0%)      | $\chi^2 =119.088$ df =1<br>p-value =0.001 |
|                       | Male             | 144 (60.3%)   | 12 (8.0%)        |   |
| Age                   | 25 and Below     | 46 (19.2%)  | 32 (21.3%)       | $\chi^2 =1.862$ df =2 p-<br>value=0.394   |
|                       | 26 – 34          | 92 (38.5%)  | 65 (43.3%)       |   |
|                       | 35 and Above     | 101 (42.3%)   | 53 (35.3%)       |   |
| Religion              | Christians       | 217 (90.8%)   | 138 (92.0%)      | $\chi^2 =0.169$ df =1 p-<br>value=0.681   |
|                       | Non-Christians   | 22 (9.2%)   | 12 (8.0%)        |   |
| Education             | Not Schooled     | 14 (5.9%)   | 4 (2.7%)         | $\chi^2 = 7.850$ df =3 p-<br>value=0.0492 |
|                       | Primary          | 70 (29.3%)  | 63 (42.0%)       |   |
|                       | Secondary        | 109 (45.6%)   | 59 (39.3%)       |   |
|                       | College/Tertiary | 46 (19.2%)  | 24 (16.0%)       |   |
| Occupation            | Employed         | 29 (12.1%)  | 25 (16.7%)       | $\chi^2 =1.702$ df= 2 p-<br>value=0.427   |
|                       | Self Employed    | 130 (54.4%)   | 75 (50.0%)       |   |
|                       | Unemployed       | 80 (33.5%)  | 50 (33.3%)       |   |
| Place of residence    | Rural            | 166 (69.5%)   | 121 (80.7%)      | $\chi^2 =5.987$ df= 2 p-<br>value=0.014   |
|                       | Urban            | 73 (30.5%)  | 29 (19.3%)       |   |
| Gravidity             | None             | 9 (3.8%)  | 7 (4.7%)         | $\chi^2 =9.404$ df= 3 p-<br>value=0.024   |
|                       | 1-2              | 63 (26.4%)  | 58 (38.7%)       |   |
|                       | 3-4              | 106 (44.4%)   | 62 (41.3%)       |   |
|                       | 5+               | 61 (25.5%)  | 23 (15.3%)       |   |

### 3.3.3 Intake of Folic acid.

This study indicated that a minority 92 (39.5%) of the women respondents used folic acid before conception. Among the couples who utilized folic acid, one out of ten 11% (10/92) used folic acid one month before conception, while majority used folic acid between two to three months 48% (32/92) as shown in Figure 5 below;





**Figure 5 Intake of folic acid before conception.**

Further analysis to test the association between folic acid intake and the couples' sociodemographic characteristics before preconception revealed a significant statistical association between age ( $p = 0.042$ ), gender ( $p=0.001$ ) and gravidity ( $p = 0.001$ ) and utilization of folic acid supplements as shown in table 7 below;

**Table 7 Association between folic acid intake with socio-demographic characteristics of the couples.**

| Independent variables |                | Dependent variable utilization of folic acid |              | Statistical significance                 |
|-----------------------|----------------|--|--------------|--|
|                       |                | No (n =296 )                                 | Yes (n =93 ) |  |
| Gender                | Female         | 141 (47.6%)                                  | 92 (98.9%)   | $\chi^2 = 103.191$ df = 1 p-value =0.001 |
|                       | Male           | 155 (52.4%)                                  | 1.0 (1.1%)   |  |
| Age                   | 25 and Below   | 51 (17.2%)                                   | 27 (29.0%)   | $\chi^2 =6.349$ df= 2 p-value= 0.042     |
|                       | 26 – 34        | 122 (41.2%)                                  | 35 (37.6%)   |  |
|                       | 35 and Above   | 123 (41.6%)                                  | 31 (33.3%)   |  |
| Religion              | Christians     | 271 (91.6%)                                  | 84 (90.3%)   | $\chi^2 =0.135$ , df= 1 p-value= 0.714   |
|                       | Non-Christians | 25 (8.4%)                                    | 9 (9.7%)     |  |
| Occupation            | Employed       | 39 (13.2%)                                   | 15 (16.1%)   | $\chi^2 =3.647$ df= 2 p-value= 0.161     |
|                       | Self Employed  | 164 (55.4%)                                  | 41 (44.1%)   |  |
|                       | Unemployed     | 93 (31.4%)                                   | 37 (39.8%)   |  |
| Place of residence    | Rural          | 215 (72.6%)                                  | 72 (77.4%)   | $\chi^2 =0.837$ df= 1 p-value= 0.360     |
|                       | Urban          | 81 (27.4%)                                   | 21 (22.6%)   |  |
| Gravidity             | None           | 13 (4.4%)                                    | 3 (3.2%)     | $\chi^2 =17.923$ df= 3 p-value= 0.001    |
|                       | 1-2            | 76 (25.7%)                                   | 45 (48.4%)   |  |
|                       | 3-4            | 141 (47.6%)                                  | 27 (29.0%)   |  |
|                       | 5+             | 66 (22.3%)                                   | 18 (19.4%)   |  |

### 3.3.4 Screening for a medical condition.

The study revealed that a majority 125(90.6%) of the women and a minority 13(9.4%) of the men had been screened for medical conditions during the preconception period. Table 8 shows that there was a significant statistical association between couple's gender (p=0.001) and level of education (p=0.029) and the screening of medical conditions before conception.

**Table 8 Association between the screening of medical conditions with selected couples' characteristics.**

| Independent variables |                  | Dependent variable<br>Screening of medical conditions |                  | Statistical significance                   |
|-----------------------|------------------|---|------------------|--|
|                       |                  | No<br>(n = 251 )                                      | Yes<br>(n = 138) |  |
| Gender                | Female           | 108 (43.0%)   | 125 (90.6%)      | $\chi^2 = 94.707$ df= 1<br>p-value = 0.001 |
|                       | Male             | 143 (57.0%)   | 13 (9.4%)        |  |
| Age                   | 25 and Below     | 53 (21.1%)  | 25 (18.1%)       | $\chi^2 = 1.379$ df= 2<br>p-value= 0.502   |
|                       | 26 – 34          | 96 (38.2%)  | 61 (44.2%)       |  |
|                       | 35 and Above     | 102 (40.6%)   | 52 (37.7%)       |  |
| Education             | Not Schooled     | 8 (3.2%)  | 10 (7.2%)        | $\chi^2 = 9.036$ df= 3<br>p-value=0.029    |
|                       | Primary          | 80 (31.9%)  | 53 (38.4%)       |  |
|                       | Secondary        | 121 (48.2%)   | 47 (34.1%)       |  |
|                       | College/Tertiary | 42 (16.7%)  | 28 (20.3%)       |  |
| Religion              | Christians       | 225 (89.6%)   | 130 (94.2%)      | $\chi^2 = 2.323$ df =1<br>p-value= 0.127   |
|                       | Non-Christians   | 26 (10.4%)  | 8 (5.8%)         |  |
| Occupation            | Employed         | 29 (11.6%)  | 25 (18.1%)       | $\chi^2 = 4.599$ df=2<br>p-value=0.105     |
|                       | Self Employed    | 131 (52.2%)   | 74 (53.6%)       |  |
|                       | Unemployed       | 91 (36.3%)  | 39 (28.3%)       |  |
| Place of residence    | Rural            | 179 (71.3%)   | 108 (78.3%)      | $\chi^2 = 2.221$ df= 1<br>p-value= 0.136   |
|                       | Urban            | 72 (28.7%)  | 30 (21.7%)       |  |
| Gravidity             | None             | 11 (4.4%)   | 5 (3.6%)         | $\chi^2 = 1.349$ , df=3<br>p-value= 0.717  |
|                       | 1-2              | 74 (29.5%)  | 47 (34.1%)       |  |
|                       | 3-4              | 113 (45.0%)   | 55 (39.9%)       |  |
|                       | 5+               | 53 (21.2%)  | 31 (22.5%)       |  |

### 3.3.5 Monitoring of weight among couples.

Approximately 123 (53%) of the women indicated that they had their weight monitored during the preconception period. In contrast a majority 156(58.6%) of the men did not monitor their weight during the preconception period. The analysis of the association between weight monitoring and socio-demographic characteristics show that there exists a significant statistical

association between the couples, education ( $p=0.006$ ), gender ( $p=0.001$ ), place of residence ( $p=0.002$ ) and weight monitoring as shown in table 9 below;

**Table 9 Association between weight monitoring and the couples' socio-demographic Characteristics**

| Independent variables |                  | Dependent variable<br>Monitoring of weight |                  | Statistical significance                       |
|-----------------------|------------------|--|------------------|--|
|                       |                  | No<br>(n = 266)                            | Yes<br>(n = 123) |  |
| Gender                | Female           | 110 (41.4%)                                | 123 (100.0%)     | $\chi^2 = 120.432$ , df = 1<br>p-value < 0.001 |
|                       | Male             | 156 (58.6%)                                | 0 (0)            |  |
| Age                   | 25 and Below     | 50 (18.8%)                                 | 28 (22.8%)       | $\chi^2 = 2.997$ , df = 2<br>p-value=0.223     |
|                       | 26 – 34          | 103 (38.7%)                                | 54 (43.9%)       |  |
|                       | 35 and Above     | 113 (42.5%)                                | 41 (33.3%)       |  |
| Religion              | Christian        | 241 (90.6%)                                | 114 (92.7%)      | $\chi^2 = 0.457$ , df = 1,<br>p-value=0.499    |
|                       | Non-Christian    | 25 (9.4%)                                  | 9 (7.3%)         |  |
| Education             | Not Schooled     | 14 (5.3%)                                  | 4 (3.0%)         | $\chi^2 = 7.225$ , df = 3<br>p-value=0.065     |
|                       | Primary          | 81 (30.5%)                                 | 52 (42.3%)       |  |
|                       | Secondary        | 125 (47.0%)                                | 43 (35.0%)       |  |
|                       | College/Tertiary | 46 (17.3%)                                 | 24 (19.5%)       |  |
| Occupation            | Employed         | 33 (12.4%)                                 | 21 (17.1%)       | $\chi^2 = 2.667$ df= 2<br>p-value=0.264        |
|                       | Self Employed    | 147 (55.3%)                                | 58 (47.2%)       |  |
|                       | Unemployed       | 86 (32.3%)                                 | 44 (35.8%)       |  |
| Place of residence    | Rural            | 184 (69.2%)                                | 103 (83.7%)      | $\chi^2 = 9.223$ df = 1<br>p-value= 0.002      |
|                       | Urban            | 82 (30.8%)                                 | 20 (16.3%)       |  |

### 3.4 Factors that influence the utilization of preconception care services among couples.

Preconception care is one of the essential components of health care for every couple. Unfortunately, many couples face barriers to accessing PCC. For this reason, it is crucial to understand the factors that are associated with the utilization of preconception care services among couples so that they can be addressed as well as influence policy formulation.

#### 3.3.1 Socio-demographic factors.

The use of family planning services was found to be influenced by age( $p=0.045$ ), gender ( $p=0.001$ ), occupation ( $p=0.030$ ), and place of residence( $p=0.026$ ) of the couples as shown in

(Table 5). Therefore, due to their significant statistical association with the utilization of family planning services. These results depicted that couples above 25 years who are either employed or self-employed are likely to use these services.

The gender ( $p=0.001$ ), level of education ( $p=0.049$ ), place of residence ( $p=0.014$ ) and gravidity ( $p=0.024$ ) influenced utilization of tetanus immunization (see Table 6). These results indicate that couples who had more than one child, and lived closer to the health facilities had a higher probability of utilizing of the tetanus immunization before pregnancy.

The utilization of folic acid supplements by women before conception was shown to be influenced by age ( $p=0.042$ ), occupation ( $p = 0.002$ ) and gravidity ( $p < 0.001$ ) (see Table 7). Almost half of the women started folic acid intake during the 2 – 3 months of pregnancy. Further, the study revealed that the couple's gender ( $p=0.001$ ) and level of education ( $p=0.029$ ) had a significant statistical association which thus influenced the couples' utilization of screening services for medical conditions, with those more likely to utilize these services having secondary education and above as shown in (Table 8). Moreover, the study reported the occurrence of high cases of overweight and obesity among the couples, gender ( $p=0.001$ ), the place of residence ( $p=0.002$ ) depicted a significant statistical association which thus influenced the utilization of weight monitoring services among the couples during the preconception period as shown in the (Table 9).

### 3.4.2 Sources of preconception care services

The couples' response on where they seek preconception care services indicated that the most preferred place was the family planning facilities 300 (77.7%) with least sought place being the school health programs 31 (8.0%) and youth-friendly centers 33 (8.6%) as shown in Table 10 below;

**Table 10 Sources of preconception care services.**

| Source                    | Freq. | Percent (%) |
|---------------------------|-------|-------------|
| Family planning           | 300   | 77.7        |
| Antenatal care            | 238   | 66.7        |
| Child welfare clinic      | 151   | 39.1        |
| Postpartum care           | 58    | 15.0        |
| Outpatient                | 102   | 26.4        |
| Youth-friendly centre     | 33    | 8.6         |
| Comprehensive care clinic | 81    | 20.9        |
| School health programs    | 31    | 8.0         |
| VCT centre                | 130   | 33.7        |
| None                      | 69    | 17.9        |

### 3.4.3 Partners support.

Partner support during preconception care influence a woman's chance to utilize preconception care services. This study assessed the support of the male partner towards the utilization of preconception care, and the majority of 133(85.3%) offered financial support during this period.

The least type of support offered was lifestyle change 18 (11.5%) during the preconception period. One man commented that; (*...as the man of the house when my wife is pregnant, my role is just to give her the financial support she requires but any other demands she can work it out herself in consultation with other women...*) (FDG 4, participant 3) as illustrated in table 11 below;

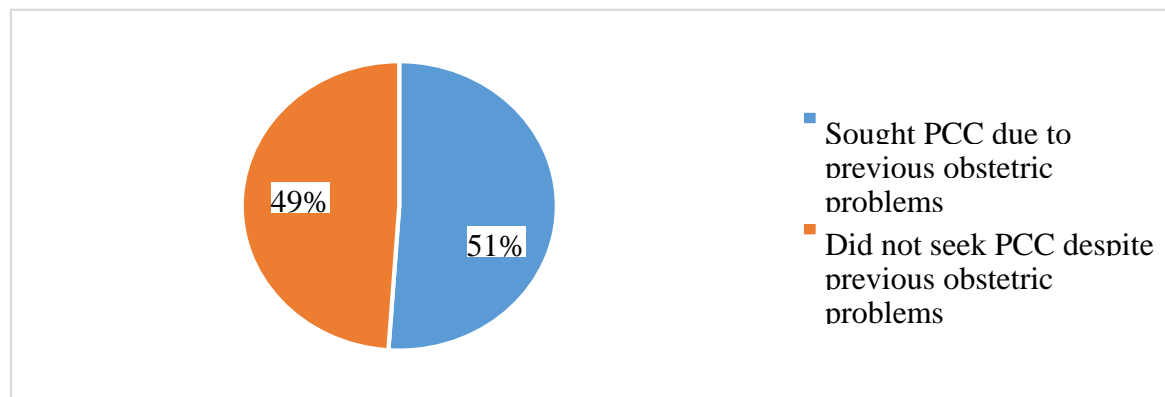
**Table 11: Type of support offered by the partner during the preconception period.**

| Support                             | Male (n = 156) |         |
|-------------------------------------|----------------|---------|
|                                     | Freq.          | Percent |
| Accompany me to the health facility | 49             | 31.4    |
| Financial                           | 133            | 85.3    |
| Psychological                       | 42             | 26.9    |
| Lifestyle change                    | 18             | 11.5    |
| None                                | 22             | 14.1    |

#### 3.4.4 Preconception care practices secondary to previous obstetric problems.

The utilization of preconception care service could be directly influenced by previous obstetric problems suffered by women in previous pregnancies. At least one out of ten of the couples 45 (11.6%) had previous experience of obstetric problems, which include; miscarriage, hemorrhage, and few cases of spina bifida. Figure 6 below shows the findings on the preconception health care seeking practice following a previous obstetric problem. Half of the couples (51.1%) who had suffered an obstetric problem on previous pregnancies sought preconception care services.

One woman commented that (*...I had a difficult first pregnancy, which had me hospitalized with preeclampsia as well as a low blood level; this made me proactive to be ready for my consecutive pregnancies, of which I had a much better experience...*) (FDG 1, participant 2)



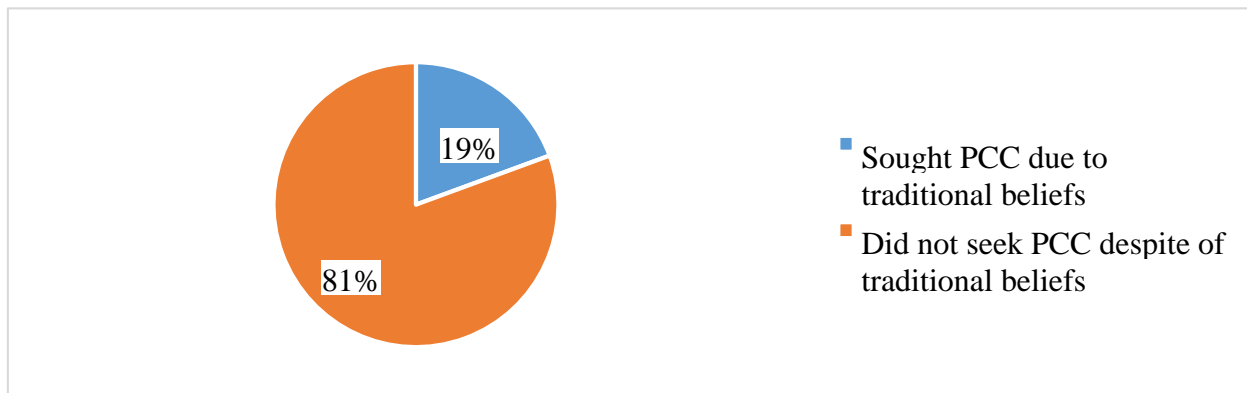
**Figure 6 Preconception practice secondary to previous obstetric problems.**

### 3.4.5 Preconception care practices secondary to traditional belief practices.

Traditional beliefs in African settings, in particular, affect the utilization of preconception care services among couples in these settings. Some of the common beliefs on the utilization of preconception care services were excessive bleeding, infertility, lack of menstrual cycle, delay on the conception, and can cause cancer.

A quarter 98 (25.2%) of the participants had heard or practiced traditional beliefs related to preconception care services. However, only 19% among those who heard or practiced traditional beliefs sought preconception care services, an indication that the majority (81%) did not seek these services because of the traditional beliefs.

One man had this to say; (*...the moment a couple starts planning for conception it is against the traditional norms and beliefs, and it can lead to barrenness; however, when they are unprepared the children will just come automatically....*) (FDG 2, participant 1) this information is presented in figure 7 below;



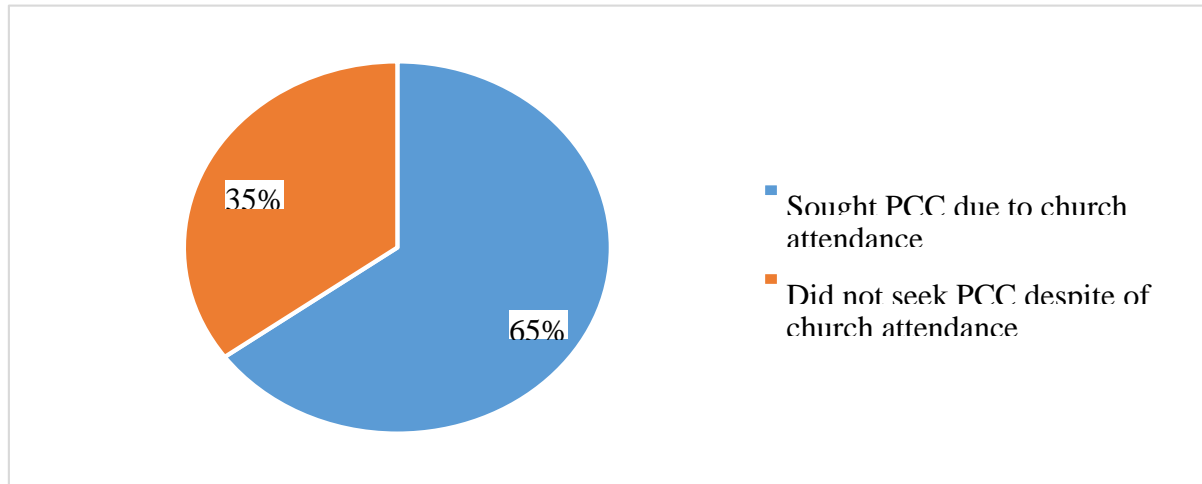
**Figure 7: Preconception practice secondary to traditional beliefs.**

### 3.5.6 Preconception cares practices secondary to attending Church.

Religious law or teachings influence health-seeking behaviors and vary between and within denominations, i.e., Christians and Non-Christians. Over 90% of the study participants were Christians, 355 (91.3%) and 305 (86%) attend Church.

The study revealed that the Church's laws or teachings affect the utilization of preconception care services. Four out of ten churches teach about preconception care services, and 198 (65%) of the couples that attend the churches are influenced to seek these services, one woman who did not seek the PCC services due to her religious background commented that;(*... Our God has always protected us and given us perfectly healthy children for many years; therefore, preparation before conception is not necessary...*) (FGD 3, participant 5) this information is shown in figure 8 below;



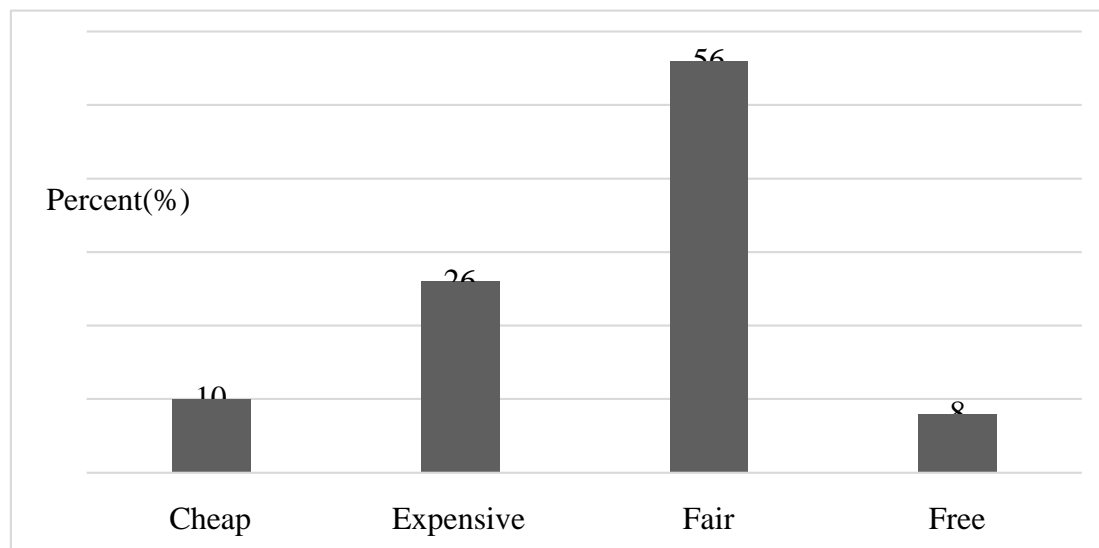


**Figure 8: Preconception practice secondary to church attendance.**

### **3.5.7 Cost of preconception care services.**

The study showed that 78 (20%) of the couples indicated that they had to pay in order to receive preconception care services. Approximately, 8 (10%) of the couples that paid for the services indicated that the cost of accessing preconception care services was cheap.

In comparison, more than half 43 (56%) indicated that the price was fair, and 6 (8%) received free preconception care services despite the indicated cost. However, a quarter of 20 (26%) of the participants regarded the preconception care services as expensive. One man indicated that; (*... as a parent my family immediate needs have the priority on the available finances, therefore, going the extra mile of paying for health care services before even conception occurs is a luxury I undoubtedly cannot afford...*) (FDG 4, participant 1) this information is shown in figure 9 below;



**Figure 9: Cost affordability of preconception care services.**

### **3.5.8 Rating of factors that are associated with the utilization of preconception care services in the health facilities.**

The couples were requested to rate the extent to which healthcare system factors were associated with their utilization of PCC services. The study participants agreed that there was a provision of health education on PCC visits 231(59.4%). However, the study participants disagreed that the staff-to-patient ratio enabled them to acquire PCC services 248 (63.7%), the health facilities are accessible 220 (56.6%), adequate preconception health care's services in hospitals near them 231 (59.3%) and that the user charges put them off from seeking PCC services 287 (73.8%). Notably, there was a commensurate agreement rating on the service delivery 195 (50.1%) and performance of health personnel 196 (50.4%) as well as the quality 199 (51.2%) of the PCC services offered in those facilities were of the required standard and satisfactory as shown in the table 12 below;

**Table 12 Participants rating on factors that are associated the utilization of preconception care services.**

| Item  | Disagree    | Agree       | Do not Know |
|---|-------------|-------------|-------------|
| There is the provision of Health Education on Preconception health care during health facility visits                         | 146 (37.5%) | 231(59.4%)  | 12 (3.1%)   |
| The Health provider staff-to-patient ratio enables me to acquire the Preconception health care services                       | 248 (63.7%) | 138 (35.5%) | 3 (0.8%)    |
| Health facilities are easily accessible   | 220 (56.6%) | 166 (42.7%) | 3 (0.8%)    |
| There are adequate Preconception health care services in hospitals near me  | 231 (59.3%) | 155 (39.9%) | 3 (0.8%)    |
| The user charges of Preconception health care put me off from seeking preconception care                                      | 287 (73.8%) | 99 (25.4%)  | 3 (0.8%)    |
| The health personnel's service delivery enables me to seek preconception care services  | 191 (49.1%) | 195 (50.1%) | 3 (0.8%)    |
| The quality of Preconception health care services offered at the health facility is of the required standard and satisfactory | 188 (48.3%) | 199 (51.2%) | 2 (0.5%)    |
| The performance of health personnel in providing Preconception health care and follow up care is appropriate                  | 191 (49.1%) | 196 (50.4%) | 2 (0.5%)    |

## 4.0 CONCLUSIONS AND RECOMMENDATIONS

### Conclusions

The findings from this study have; first helped to depict a low-level of knowledge on preconception care services among couples, whereby only 41% (159) of the couples had adequate knowledge on preconception care while the rest 59% (230) had inadequate knowledge. Most especially the married men, with a relatively large proportion unable to point out the components of preconception health care. Moreover, the primary source of information on preconception care services in the health facilities. Health education on preconception care is vital in improving the overall utilization of preconception care services.

Secondly, the utilization of preconception care services among the couples in Kanduyi sub-county in Bungoma county is very low, especially on some services. For instance, the majority 65% (251) of the couples were not screened for any medical condition and significant proportion 61% (238) were not in any family planning program prior to conception. This occurrence was due to the fact that the couples did not know of the existence of preconception care services.

Furthermore, the socio-demographic factors that were noted to influence the utilization of preconception care services among couples include; level of education (p=0.029), age (p=0.042), occupation (p=0.030), place of residence (p=0.002) and gravidity (p=0.001).

In contrast, the socio-cultural factors were partners' support 85.3%, traditional beliefs 81%, and church attendance 65%. The reproductive health factor that influenced the utilization of preconception care were previous obstetric complications which affected 51% of the couples who opted to seek these services in fear of recurrence of the health complication or to avert the situation.

Development of initiatives to empower and train the couples, on the value of preconception care services despite the prevailing traditional and cultural beliefs may lead to an improvement in the utilization of preconception care services. Lastly, the couples indicated that the low staff-to-patient ratio, inaccessibility of health facilities, and inadequacy of preconception care services in the health facilities were the health care system factors that were associated with the overall low utilization of the preconception care services. Preconception care services ought to be integrated into all the existing reproductive health care facilities to facilitate ease of access to health care services, to improve utilization of the services

### **Recommendations**

The Study recommends that the ministry of health and Bungoma County government should scale up education and empowerment initiatives and programs targeting the men, with the overall aim of enhancing the utilization of preconception care services by the couples. The ministry of health should integrate the various preconception health care services in all the existing reproductive health care facilities to facilitate ease of access to health care services. The ministry of health, faith-based organizations, as well as the non-governmental organizations, should develop initiatives to empower and train the couples, especially the men, on the value of preconception care services despite the prevailing traditional and cultural beliefs.

### **REFERENCES**

- Andersen, R. M., Davidson, P. L., & Baumeister, S. E. (2014). Improving access to care. Changing the US health care system: key issues in health services policy and management. San Francisco: Jossey-Bass, 36(3), 33-69.
- Awosan, K. J., & Hassan, M. (2018). Perception and utilization of tetanus toxoid immunization among pregnant women attending a tertiary center in North-West, Nigeria. *Journal of Drug Delivery and Therapeutics*, 8(6), 119-124.
- Collins. L.C. (2016). Knowledge, attitudes, and beliefs about Preconception care among American adolescent females.
- Darroch, J.E., Ashford, L.S., Woog, V., & Bankole, A., (2016) Costs and benefits of meeting contraceptive needs of adolescents. Guttmacher Institute.
- Gitaka, J., Abuya, T., Mwambeo, H, M., Githanga, D., Gatungu, D M., & Natecho, A. (2018). Evaluating quality neonatal care, call Centre service, tele-health and community engagement in reducing newborn morbidity and mortality in Bungoma county, Kenya. *BMC health services research*, 18(1), 1-9.

- Imam, A. M., Lassi, Z. S., Dean, S. V., & Bhutta, Z. A. (2014). Preconception care: screening and management of chronic disease and promoting psychological health. *Reproductive Health*, 11(3), 1-20.
- Lassi, Z. S., Kedzior, S. G., Das, J. K., & Bhutta, Z. A. (2019). PROTOCOL: Effects of preconception care and periconception interventions on maternal nutritional status and birth outcomes in low- and middle- income countries: A systematic review. *Immunology*, 15(1-2).
- World Health Organization. (2013). Country cooperation strategy for WHO and Saudi Arabia 2012-2016 (No. WHO-EM/PME/003/E). World Health Organization. Regional Office for the Eastern Mediterranean.
- World Health Organization. (2014). Nutrition-sensitive interventions and programs. *The Lancet*, 382(9891), 536-551.
- World Health Organization. (2018). Vaccination Coverage Cluster Surveys: reference manual (No.WHO/IVB/18.09). World Health Organization.
- World Health Organization. (2019). Protecting All Against Tetanus: a guide to sustaining maternal and neonatal tetanus elimination (MNTE) and broadening tetanus protection for all populations.