

Health Providers' Self Reported Provision of Preconception Care and Associated Factors in Kisumu County-kenya

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Abstract

Background Preconception care (PCC) is the provision of health interventions to women and couples before conception occurs and is valuable in preventing and controlling noncommunicable diseases. In Africa, more so in Kenya, maternal and neonatal health indicators have remained poor. The key constraint limiting progress has been the gap between what is needed and what exists in terms of skills and human resources and infrastructure. This gap was yet to be measured for PCC in Kenya, more so in Kisumu County.

Methods. Using a cross-sectional design, this study specifically sought to determine the rate of self-reported PCC provision and to illustrate how it is influenced by health provider characteristics. Structured interviews were conducted with health providers (n=476) to ascertain their knowledge, perceptions and practice of PCC care. The significance of the differences in proportions was determined by the χ^2 . Student's t test and linear regression were used to show the relationship between the factors and the PCC provision rate.

Results. Self-reported PCC provision was estimated at 37%. There was a significant difference in the mean for cadres {nurses (M=70.04, SD=8.951) and non-nurses (M=71.90, SD=8.732); t (473) =-2.23, $P=0.026$ }, years of experience up to 5 years (M=72.04, SD=8.417) and more than 5 years (M=69.89, SD=9.283); t (465) =2.63, $P=0.009$. PCC inclusion in reporting tool was a significant predictor ($\beta=0.6$, t (26) =8.64, $P<0.001$, 95% CI=0.46-0.74) of provision. The mean provision per level (M=60.21, SD=4.902; t (26) =-5.06, $P<0.001$) and type of service (M=69.36, SD=4.924; t (26) =4.63, $P<0.001$) were significantly different. The health workers felt PCC was an important service whose provision was low due to inadequate human capital investment.

Conclusion. Self-reported provision of PCC by health workers was relatively low and was influenced by the cadre of health workers and their years of experience. It was also demonstrated that the inclusion of PCC in reporting systems, the levels and types of facilities were significant predictors of self-reported provision of PCC. Investing in on-the-job training for health providers, especially nurses, establishing a reporting system for PCC activities, and providing care in primary health facilities in rural areas can improve PCC service delivery.

BACKGROUND

Preconception care (PCC) is the provision of biomedical, behavioral and social health interventions to women and couples before conception occurs. PCC is valuable and key in preventing and controlling noncommunicable diseases. The UN Assembly of 2015 declared the 3rd Sustainable Development Goal to ensure healthy lives and promote wellbeing for all ages (1). The maternal and neonatal mortality rates are still high globally. In Kenya, the maternal mortality rate was 362 per 100,000 live births, and in Kisumu County, it was 495 per 100,000 live births(2). The challenge in achieving the desired maternal and neonatal health in Kenya was cited as a gap between what is needed and what exists in terms of skills

and supplies, among other resources, in the face of increased demand(3). This gap has yet to be ascertained in the case of preconception care. Consequently, this could have led to an imbalance in the continuum of care, with priority being given to interventions targeting prenatal, perinatal and postpartum periods at the expense of preconception care, as evidenced in the national roadmap to the attainment of MNH's strategic objective 5(4).

The WHO identified improvement of health systems (infrastructure, management, distribution of goods, training of providers) to deliver preconception care as a priority research area. Preconception care is key in improving maternal and neonatal health indicators(5). It also creates demand for other services, such as antenatal care. However, the PCC rate of provision has not been measured in the current setting. Health care service provision depends on factors such as providers' experiences, individualized ability and personalities (6). Thus, the various cadres of health care professionals necessary for its implementation diversify preconception care. These include nurses, clinical officers, nutritionists and community health extension workers as well as community health assistants. The training of these professionals differs greatly in terms of curriculum and length of training. The training levels also differ; that is, we have those trained at the certificate, diploma, undergraduate and postgraduate levels. This raised the question of whether these disparities affect preconception care provision. It further questioned the adequacy of training for the role of implementing this care and whether some cadres have a competitive advantage of intellectual capital required in PCC provision. This study, therefore, estimated the rate of preconception care provision and determined how it is influenced by health worker characteristics in health facilities in Kisumu County of Kenya. The findings of this study may guide stakeholders in program planning for the integration of preconception care with other services in the continuum of maternal and newborn health.

METHODS

Study Area and Design

A descriptive and analytical cross-sectional study was carried out at facilities in Kisumu County. Kisumu County is one of the newly devolved counties of Kenya. It covers an area of 805 square miles and has a population of 968,879 (KNBS, 2009). It has 7 sub-counties, namely, Kisumu West, Kisumu Central, Kisumu East, Seme, Muhoroni, Nyando and Nyakach. Kisumu County has a total of 129 public health facilities.

Sample size and sampling

The sample size of $n = 28$ was derived from a sampling frame of 129 health facilities using the corrected Fishers formula (7). Similarly, a sample size of $n = 317$ health workers and 377 clients were initially derived by Fisher's formula. Previous studies have recommended the use of a design effect factor (deff) of 1.5 as a benchmark in respondent-driven sampling (8). This study employed stratified and purposive sampling, and to reduce sampling error, the calculated sample sizes of $n = 317$ were multiplied by 1.5 to arrive at $n = 476$.

The study employed multistage sampling. First, stratified sampling was performed, whereby the 7 sub-counties served as strata. Purposive sampling was used to select 2 high-volume dispensaries, health centers, and subcounty hospitals from each subcounty. To arrive at the health provider sample, proportionate sampling of the cadres was done based on the number of health workers in each cadre in the county.

Data collection

Quantitative data were collected first with the aid of a self-administered questionnaire. The respondents were reproductive health service providers within the facilities under study. They were drawn from departments that provided antenatal care, postnatal care, well-child health services, gynecological care and childbirth services. This questionnaire was adopted from a previous study in Ethiopia as alluded to earlier (Kassa, Human, & Gemed, 2019). The variables that were elicited as depicted in the conceptual framework were level of training, knowledge of PCC for each cadre, perceptions of PCC, and adequacy of training on PCC.

The level of training was elucidated by a prompt in the questionnaire. In the questionnaire, the health care providers were asked to list at least 5 PCC interventions. Level of knowledge was assessed against the 5 responses, with the highest being 5 correct responses and the lowest being 0–1 correct response. The attitude was measured using a Likert scale where the health workers were asked questions on their perception of the importance of preconception and their perceived competence on at least 5 interventions. The Likert scale had 5 options ranging from strongly agree to strongly disagree.

Data management and statistical analysis

The self-administered questionnaires were checked for completeness. Data forms were created with Epi Info version 7(9), verified and cleaned. It was then exported to SPSS version 21.0, where both descriptive and inferential analyses were performed(10). Proportions of the *yes* and *no* responses on whether each of the interventions for each service in the package as per the checklist was provided were calculated and presented as percentages. Then, the means for all of the services in the package were determined. The significance of the difference in the means was determined by the one sample T test at a *P* value of equal to or less than 0.05. Furthermore, the rate of use was derived from the proportion of women that each health provider indicated they had given care.

Descriptive statistics are presented in contingency tables with counts and proportions. Bivariate analysis was performed on the level of knowledge and practice. The differences in proportions of the other variables were determined by the chi-square statistic. Variables with significant *P* values were fitted into a multilinear logistic regression analysis to adjust for confounders and thus determine their influence on the provision of PCC. The strength of the association was measured by the odds ratio and 95% confidence interval. Furthermore, the independent sample T test was used to show the significance in the differences in means for the various characteristics of the health care providers.

RESULTS

A total of 28 facilities were involved in the study, with 50% (14) of the facilities being inpatient service providers and the rest being both inpatient and outpatient service providers. Most of the facilities (64.3%, 18) were in rural settings, while the remaining 35.7% (10) came from urban settings.

A total of 475 reproductive health workers responded to the questionnaire out of the sample of n = 476. The resulting response rate was 99.8%. Every client approached and gave consent was interviewed until the sample size was attained.

Demographics

Table 1 presents the demographic characteristics of the health care provider respondents. The mean PCC engagements reported were 3.7 for every 10 clients seen, which provided a basis for stratification. When stratified into those who reported having had ≤ 3 PCC engagements for every 10 clients seen versus those who had > 3 , there was a significant difference between the cadres and facility levels.

Table 1
Demographic characteristics of health providers and number of PCC engagements

Characteristics	Grouping	Preconception engagements		Total	P value
		≤ 3	> 3		
Age (Years)	≤ 30	46 (106)	54 (125)	49 (231)	0.612
	Above 30	44 (105)	56 (136)	51 (241)	
	Total	45 (211)	55 (261)	100 (472)	
Marital status	Married	44 (143)	56 (180)	69 (325)	0.749
	Not Married	46 (67)	54 (80)	31 (147)	
	Total	44 (210)	54 (260)	100 (472)	
Sex	Male	46 (59)	54 (69)	27 (128)	0.716
	Female	44 (153)	56 (193)	73 (346)	
	Total	45 (212)	55 (262)	100 (474)	
Cadre	Nurse	46 (123)	54 (142)	56 (265)	0.013
	Doctor	21 (8)	79 (30)	8 (38)	
	C.O	53 (40)	47 (35)	16(75)	
	Nutrition	48 (23)	52 (25)	10 (48)	
	Lab Tech	37 (18)	63 (31)	10 (49)	
	Total	45 (212)	55 (263)	100 (475)	
Level of Education	Certificate	43 (3)	4	1 (7)	0.867
	Diploma	46 (139)	165	64 (304)	
	Degree	43 (69)	90	33 (159)	
	Masters	20 (1)	4	1 (5)	
	Total	45 (212)	263	100 (475)	
Experience2	≤ 5 years	47 (112)	53 (127)	51 (239)	0.400
	> 5 Years	43 (98)	57 (130)	49 (228)	
	Total	45 (210)	55 (257)	100 (467)	
Subcounty		2	0	2	0.505
	Gem	36 (5)	64 (9)	3 (14)	
	Kisumu	44 (165)	56 (210)	78 (375)	

	K. West	58 (7)	42 (5)	3 (12)	
	Muhoroni	56 (10)	44 (8)	4 (18)	
	Nyakach	31 (4)	69 (9)	3 (13)	
	Nyando	45 (14)	55 (17)	7 (31)	
	Seme	50 (5)	50 (5)	2 (10)	
	Total	45 (212)	55 (263)	100 (475)	
Facility Level	Level 2& 3	52 (58)	48 (54)	24 (112)	0.049
	Level 4 &5	42 (152)	58 (207)	76 (359)	
	Total	45 (210)	55 (261)	100 (471)	

Data are in proportions, counts in brackets. C. O-clinical officer. Statistical significance was determined by χ^2 at $P \leq 0.05$. K- Kisumu

The influence of human capital on the provision of preconception care

Human capital is the knowledge, skills and experiences owned and used by individuals. In this study, it was conceptualized as knowledge of preconception care for each cadre of service providers, perceptions of the importance of preconception care, their practice in the implementation of this care and adequacy of training on preconception care.

Knowledge. Those workers who were able to give 5 correct interventions in the preconception package were considered knowledgeable. From the study, at least 50% of the health workers were found to be knowledgeable about preconception care, with the exception of lab technicians. The highest proportion of health workers found knowledgeable at 76.3% (n = 38) were doctors. The knowledge status varied across the various health provider characteristics. There was a significant difference in knowledge among the cadres ($P= 0.023$) and the level of education ($P= 0.01$) (Table 2).

Table 2
Health worker characteristics and knowledge status

Characteristics	Grouping	Knowledgeable		Total	P value
		Yes	No		
Age	30 and Below	106	125	231	0.612
	Above 30	105	136	241	
	Total	211	261	472	
Marital status	Married	143	180	325	0.749
	Not Married	67	80	147	
	Total	210	260	472	
Sex	Male	75	53	128	0.408
	Female	188	158	346	
	Total	263	211	474	
Cadre	Nurse	138	127	265	0.023
	Doctor	29	9	38	
	Clinical Officer	46	29	75	
	Nutrition	28	20	48	
	Lab Tech	22	27	49	
	Total	263	212	475	
Level of Education	Degree and above	104	60	164	0.010
	Diploma or Certificate	159	152	311	
	Total	263	212	475	
Experience ²	Up to 5	138	101	239	0.267
	More than 5 Years	120	108	228	
	Total	258	209	467	
Facility Level	Level 2 & 3	61	51	112	0.618
	Level 4 & 5	200	158	358	
	Total	261	209	470	

Perceptions of preconception care. Regarding perceptions, 86.4% (n = 472) of the staff appreciate that preconception care is as important as other health packages, such as ANC, in the continuum of maternal

health care. They also believe that a hospital setting is adequate to provide care (67.4%, n = 472) and feel that PCC should be a priority in their daily workload (49.5%, n = 472). Many note that there is inadequate time to provide PCC (41%, n = 472), while a good number (22%, n = 472) are unsure.

A total of 81.6% of the doctors interviewed expressed confidence in their ability to provide comprehensive PCC, while only 29.9% and 20.8% of the nurses and lab technicians felt competent, respectively. Consequently, these perceptions were found to have a significant association with the provision of preconception care. There was a significant difference in the means for those who felt PCC was important ($P= 0.003$), was a priority ($P= 0.048$) and the hospital setting was the best place to offer it ($P= 0.007$) (Table 3).

Table 3
Perceptions and PCC

Characteristic	Grouping	N	M	SD	SEM	t	Df	P
Preconception care is as important as ANC	Strongly Agree	297	70.51	8.409	.488	2.96	345	.003
	Strongly Disagree	50	74.34	8.775	1.241			
A hospital setting is the best place to provide preconception care	Strongly Agree	184	68.01	8.496	.626	2.01	73.40	.048
	Strongly Disagree	51	70.98	9.547	1.337			
PCC is a high priority in my workload	Strongly Agree	111	68.49	8.695	.825	2.75	141	.007
	Strongly Disagree	32	73.38	9.435	1.668			
No enough time to provide PCC	Strongly Agree	105	71.98	8.878	.866	-1.41	191	.159
	Strongly Disagree	88	70.15	9.100	.970			
I do not have the appropriate skills to offer preconception care	Strongly Agree	116	73.75	8.236	.765	-2.35	259	.020
	Strongly Disagree	145	71.13	9.503	.789			

Statistical significance was determined by Student's t test at $P \leq 0.05$.

Most doctors, 65.6% (n = 38), felt their training was adequate to prepare them to give care, while only 29.2% of the laboratory technicians had similar sentiments. Furthermore, the respondents were required to indicate whether they had ever learned about specific services in the PCC package and their responses documented. A total of 40.3% (n = 471) of health providers indicated that they were trained on the risks

associated with tobacco use and how to discourage it, while only 1.1% (n = 471) felt they were adequately prepared to manage and prevent sexually transmitted infections as part of PCC. The outcomes deduce that the health providers were exposed to most of the concepts on PCC during their preservice training, although a good number indicated having not learned about vaccine-preventable infections of preconception relevance 189 (40.8%), tobacco use and its relevance in preconception care 190 (40.3%) and female genital mutilation diagnosis and management 159 (33.5%).

Human capital characteristics and PCC provision. An independent-samples t test was conducted to compare the provision of PCC and various characteristics of the health care providers. There was a significant difference in the means of reported provision of PCC between the cadres for nurses (M = 70.04, SD = 8.951) and other providers (M = 71.90, SD = 8.732); $t(473) = -2.23, P = 0.026$, years of experience up to Table 9. Although the t test did not show a significant difference in the mean of provision as per knowledge status, the lack of it was cited as a challenge in the provision of PCC during the FGD. As was the case for cadre of health workers affecting provision of PCC.

A linear regression analysis model was applied to adjust for confounders in the original t test and multilinear logistic regression and significant determinants of PCC service provision. The model applied allows the entry of method and cases to be excluded listwise. ANOVA was used to determine model significance. A significant regression model was found, and the model statistics were $F(2,464) = 5.97, P = .003, R^2 = .03$. Only cadre ($b = 0.01, t(464) = 2.23, P = .026$) and years of experience ($b = -0.13, t(464) = -2.79, P = .005$) were significant determinants of PCC provision (Table 4).

Table 4
Human Capital and Preconception Care Provision

Characteristic	Grouping	N	M	SD	SEM	t	df	P
Age	30 and below	231	71.51	8.721	.574	1.45	470	.148
	Above 30	241	70.32	9.053	.583			
Sex	Male	128	70.40	9.670	.855	-0.63	205.59	.531
	Female	346	71.01	8.594	.462			
M/status	Married	325	70.98	9.055	.502	0.56	470	.579
	Not Married	147	70.49	8.556	.706			
Level of Education	Degree and above	164	71.79	8.687	.678	1.64	473	.101
	Diploma or Certificate	311	70.38	8.977	.509			
Cadre	Nurses	265	70.04	8.951	.550	-2.28	473	.023
	Non Nurses	210	71.90	8.732	.603			
Experience (Years)	Up to 5	239	72.04	8.417	.544	2.63	465	.009
	More than 5	228	69.89	9.283	.615			
Adequate PCC training	Yes	222	71.50	8.924	.599	1.46	473	.145
	No	253	70.31	8.847	.556			
Knowledgeable on PCC	Yes	263	71.08	8.654	.534	0.60	473	.552
	No	212	70.59	9.196	.632			
Competent	Yes	160	71.30	9.111	.720	0.76	473	.448
	No	315	70.64	8.788	.495			

DISCUSSION

From the study, it was realized that health workers reported an average of 3.7 PCC engagements for every 10 reproductive health clients attended to. Furthermore, 55.6% (n = 471) of health workers were found to be knowledgeable about preconception care. This is considerably higher than other studies done in Africa. This finding collaborated with the focussed grouped discussion, which demonstrated that the health workers had a good grasp of what PCC was. A study in Egypt reported a knowledge level of 22% for all health workers, while another study in Ethiopia estimated it at 31%(11, 12). The latter study further revealed that health workers who reported access to the internet were significantly more knowledgeable than others. Thus, the difference could be attributed to the fact that the questionnaires for this study were self-administered and there was a possibility of access to information from the internet via mobile

technology. Nevertheless, the highest number of health workers who were found knowledgeable at 76.3% (n = 20) were doctors. This is congruent with a study in Taiwan that found the level of knowledge of general practitioner, a cadre similar to doctors, to be 75%(13). This high level of knowledge in this cadre could be attributed to the length of training and consequently the depth at which the curriculum delved into preconception information.

The level of knowledge was higher among those providers from referral facilities (level 4 and 5), 76.7% (n = 201), than those in primary level facilities (level 2 and 3), 23.3% (n = 61). This is in agreement with another study, which demonstrated that the knowledge level was higher among those workers working in larger facilities(12). Furthermore, the staff indicated that they had never had any formal updates on preconception care, and they also had varied views about the adequacy of the training received at their training institutions. Most of the doctors (65.4%) felt their training was adequate compared to the overall figure of 46.5%. This level of knowledge and its felt adequacy could be related to the number of years of training for this cadre of health workers, implying the depth of interaction with preconception care content. Thus, to bridge this gap in knowledge within the health worker population, in-service training programs or updates are necessary. Regarding perceptions, 86.4% (n = 469) of the staff appreciate that preconception care is as important as other health packages, such as ANC, in the continuum of maternal health care. This is different and favourable considering other studies, such as Mazza et al 2013, where health workers indicated that preconception care was the lowest priority in their daily workloads(14). The health workers also believed that a hospital setting is adequate to provide care (67.4%, n = 469) and felt that PCC should be a priority in their daily workload (49.5%, n = 469). The study demonstrated that these perceptions significantly influenced the provision of preconception care ($t = 2.01$, $DF = 73.40$ $P = .048$, & $t = 2.75$, $df = 141$ $P = 0.007$).

Many noted that there was inadequate time to provide PCC (41%), while a good number (22%) were unsure. A lack of enthusiasm on the part of health workers was identified as one of the major barriers to the provision of preconception care (3, 4, 15). This lack of enthusiasm could be related to inadequate rewards for effort, a heavy workload that puts pressure on time resources and an unsupportive environment. This was also suggested by a study that demonstrated that health providers who earned higher pay were likely to provide PCC (12). Approximately 81.6% of the doctors interviewed expressed confidence in their ability to provide comprehensive PCC, while only 29.9% and 20.8% of the nurses and lab technicians felt competent, respectively. Furthermore, the study was able to demonstrate that the felt incompetency to provide this care negatively influenced its provision ($t(469) = -2.35$, $P = 0.02$). This may be a true finding considering that health workers do not practice what they do not know. Knowledge is an important predictor for the implementation of preconception care(12). In this study, in Ethiopia, those with poor PCC knowledge had 4 times higher odds of not practicing PCC. Investing in human capital through in-service training is important. This is because health workers are primarily responsible for putting up-to-date evidence into practice preconception care included(12).

An independent-samples t test was conducted to compare the provision of PCC and various characteristics of the health care providers. There was a significant difference in the means for nurses (M

= 70.04, SD = 8.951) and non-nurses (M = 71.90, SD = 8.732); $t(232) = 2.23, P = 0.026$. These results suggest that the cadres of health workers influence the provision of PCC. Specifically, our results suggest that nurses were less likely to provide care. This is in keeping with another study that concluded that nurses and midwives had 2 times higher odds of not providing preconception care. This may be because nurses are found in all levels of facilities and form a larger proportion of health workers. Strategies to increase the provision of PCC targeting nurses may have the greatest impact. This study was able to demonstrate that the work experience of health workers negatively influenced the provision of PCC. This mean provision of PCC among those with less than 5 years of experience was higher than that of those who had worked for more than 5 years (M = 72.04, SD = 8.417 and M = 69.89, SD = 9.283, respectively) ($t(464) = -2.79, P = 0.005$). This is unusual since it is appreciated that clinical experience increases prowess in practice. However, preconception is a relatively new concept that may not have been included in the curriculum for those who underwent their basic training before the 21st century. Thus, there is a need for on-the-job training or updates on current issues, including PCC.

CONCLUSIONS

The results show a low rate of self-reported PCC provision at 39%. Human capital investment in preconception care is low in the study setting. The results demonstrate that human capital is a determinant of preconception care provision. It specifically demonstrated the importance of various aspects of human capital, i.e., knowledge, perceptions, competence and adequacy of training in the provision of this care. Furthermore, it showed that the nursing cadre has a higher probability of providing this care. Additionally, training community health volunteers can improve the uptake of the service.

Declarations

Ethics approval and consent to participate

Ethical review was done by the Masinde Muliro University of Science and technology Ethical Review Board (MMU/COR;403012 vol 2(5) and Jaramogi Oginga Odinga Teaching and Referral Hospital (ERC.IB/vol.1/448). The permission to conduct the study was given by the National Commission for Science, Technology and Innovation (NACOSTI) license number NACOSTI/P/18/22295/24670. During the study, informed consent was sought with full information being provided and comprehension being affirmed. Confidentiality was ensured through anonymity (using unique numbers), privacy during interviews and withdrawal at any point. For further inquiry into the research, the respondents were provided with the contacts of the principal investigator. The questionnaires were archived soon after data entry. During analysis, personal identifiable information was coded. The spreadsheet was password-protected and encrypted. Facility names and key informants' names were not used during reporting

Consent for publication

All authors read and approved the manuscript for publication

Availability of data and materials

Data was deposited in a public repository and can be sourced <https://figshare.com/s/ee0598d225a42e5248e5>

Competing interests

The authors declare that there are no competing interests.

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Authors' contributions

ENM, CO and RE designed the study, ENM collected the data, MSS and ENM performed data analysis, ENM and LN developed the draft manuscript. All authors read and approved the manuscript.

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References

1. Sustainable Development Goals. | United Nations Development Programme [Internet]. [cited 2023 Jul 12]. Available from: https://www.undp.org/sustainable-development-goals?gclid=CjwKCAjwuqiiBhBtEiwATgvixOc3-XBSpt1pAQvyWihavRcjmFXcaJm87CIQ4KOMPE64Q080-7SF8xoCuxEQAvD_BwE.
2. KNBS. Kenya Demographic and Health Survey 2014. 2015.
3. MOH. Kenya 2010–2014 Reproductive Health Research Agenda. Nairobi; 2010.
4. MOH. National Road Map for Accelerating the Attainment of MDGs Related to Maternal and Newborn Health in Kenya. 2010.
5. Dean SV, Lassi ZS, Imam AM, Bhutta ZA, Al-Salem E, Zafar T, et al. Preconception care: nutritional risks and interventions. *Reprod Health*. 2014;11(Suppl 3):3.
6. Mosadeghrad AM. Towards a theory of quality management: an integration of strategic management, quality management and project management. *Int J Modelling Oper Manage*. 2012;2(1):89.
7. Mugenda OM, Mugenda AG. (2003) *Research Methods, Quantitative and Qualitative Approaches*. ACT, Nairobi. - References - Scientific Research Publishing [Internet]. [cited 2022 May 10]. Available

from: [https://www.scirp.org/\(S\(351jmbntvnsjt1aadkposzje\)\)/reference/ReferencesPapers.aspx?ReferenceID=1917785](https://www.scirp.org/(S(351jmbntvnsjt1aadkposzje))/reference/ReferencesPapers.aspx?ReferenceID=1917785).

8. Hulland EN, Blanton CJ, Leidman EZ, Bilukha OO. Parameters associated with design effect of child anthropometry indicators in small-scale field surveys. *Emerg Themes Epidemiol*. 2016;13(1).
9. Com Ref - Check. : Introduction User Guide | Epi Info™ | CDC [Internet]. [cited 2023 Jul 26]. Available from: <https://www.cdc.gov/epiinfo/user-guide/command-reference/introduction.html>.
10. IBM SPSS Statistics | IBM [Internet]. [cited 2023 Jul 26]. Available from: <https://www.ibm.com/products/spss-statistics>.
11. Ayalew Y, Mulat A, Dile M, Simegn A. Women's knowledge and associated factors in preconception care in adet, west gojjam, northwest Ethiopia: A community based cross sectional study. *Reprod Health*. 2017;14(1).
12. Kassa A, Human S, Gameda H. Level of Healthcare Providers' Preconception Care (PCC) Practice and Factors Associated with Non-Implementation of PCC in Hawassa, Ethiopia. *Ethiop J Health Sci [Internet]*. 2019 Jan [cited 2019 Sep 17];29(1):903–12. Available from: <http://www.ncbi.nlm.nih.gov/pubmed/30700958>.
13. Genuis SJ, Genuis RA. Preconception Care: A New Standard of Care within Maternal Health Services. *Biomed Res Int*. 2016;2016.
14. Mazza D, Chapman A, Michie S. Barriers to the implementation of preconception care guidelines as perceived by general practitioners: a qualitative study. *BMC Health Serv Res*. 2013;13:36.
15. M'hamdi HI, van Voorst SF, Pinxten W, Hilhorst MT, Steegers EAP. Barriers in the Uptake and Delivery of Preconception Care: Exploring the Views of Care Providers. *Matern Child Health J*. 2017;21(1):21–8.