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Improving Postnatal Mother-Infant Bonding Through Interactive Attachment Training among Pregnant Adolescents in Zaria Metropolis

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Abstract

Prenatal fetal-maternal attachment can enhance maternal-infant attachment leading to cognitive and social infants development. The study aimed to evaluate the effect of interractive attachment training on postnatal mother-infant bonding of pregnant adolescents attending antenatal clinics at Primary Healthcare Centers (PHCs) in the Zaria metropolis. The study adopted a quasi-experimental study design, the Controlled Interrupted Time Series (CITS) approach; to allow for the evaluation of maternal-infant attachment from the third trimester of pregnancy through their various postpartum visits to PHCs for immunization up to the sixth month postpartum period. The participants were selected using a multistage sampling technique to obtain data from 302 adolescent mothers assigned to the study and control groups that is; 151 participants to each group. The instruments used were a structured and validated interviewer-administered questionnaire and an observation checklist before and after the intervention. Data collected were analyzed using Statistical Package for Social Science (SPSS) version 22. Descriptive statistics of mean and standard deviation were presented on frequency/percentage tables while inferential statistics was used in the form of chi-square and t-test to evaluate the effect and line charts for the trends of the effect. At the pretest, no statistically significant difference in the pretest means knowledge (p-value = 0.466) scores of mothers between the study and control groups. At post-tests, the mean knowledge and practice scores of mothers in the study group improved significantly (P-value knowledge =<0.001; practice =<0.001) at the first week, (P-value knowledge =<0.001; practice =<0.001) at 6th week, (P-value knowledge =<0.001; practice =<0.001) at 10th week, (P-value knowledge =<0.001; practice =<0.001) at 14th week and (P-value knowledge = <0.001; practice = <0.001) at 6th month postpartum. Mothers in the study group were more satisfied with their role of maternal attachment than those in the control group (p-value <0.001). Hence, implementing interactive attachment training programs is a suitable solution for attainment of postnatal maternal-infant bonding and resultant socio-cognitive development of infants born to adolescent mothers.

Keywords: Antenatal Clinic; Interractive Attachment Training; Maternal-Infant Attachment; Pregnant Adolescents.

1.0 Introduction

Attachment is an important component of the motherhood role and identity as well as basis for infant future cognitive and psychosocial developments. Attachment is a set of internal behaviors that would cause the infant to become closely related to his/her mother (Kohan, 2017). Maternal-infant attachment is the process of formation of a love bond that develops as a result of a satisfying and pleasing interaction between the mother and the baby; this bond can be a unique demonstration of affection that continues over time (Bowlby, 1992). Building attachment towards an infant contributes to the process of maternal role attainment in a way that motivates the mother for care giving behaviors (Kim and Rim, 2015). Attachment as a unique process could be affected by many factors like mental condition, social support, mother's age, parity, etc. which vary among different cultures (Memchoubi, 2020). Attachment is established during pregnancy and shown to be an important factor in predicting post-partum attachment behaviors; as it prepares the mother for transition to motherhood period (Kohan, 2017). Mother's commitment, attachment and preparation for taking care of her child during pregnancy are the main parts of the motherhood process and for reaching the maternal identity (Mercer, 2004). Being attached to the fetus and sacrificing for him/her is a responsibility that mothers should be committed to from the pregnancy period (Mercer, 2004).

However, adolescent mothers are a high-risk group of mothers for child abuse and neglect; they have more frequently experienced a history of childhood neglect, physical and sexual abuse and inconsistent parenting than have adult mothers (King *et al.,* 2019). Multiple risk factors in adolescent pregnancy and motherhood may compromise their relationship with their infants. They tend to suffer more than older mothers from psychiatric disorders, such as postpartum depression, posttraumatic stress syndrome, substance abuse and personality disorders (Akter, 2019). Adolescent motherhood is more common among individuals with lower socioeconomic status and poor education; they show less sensitivity towards their children's needs and engage in less affectionate behavior than older mothers (Firk *et al.,* 2015). All these factors can be associated with an increased risk of child neglect and maltreatment among adolescent mothers. Similarly, the cultural behavior of 'kunyan' literally known as 'shyness' or 'bashfulness'; is a common regional practice among first-time mothers in which they are expected to exhibit a high level of shyness when interacting and caring for their children. This however can reduce the quality of infant care and level of maternal-infant attachment among adolescent mothers. This may predispose children of adolescent mothers to having disturbed cognitive and emotional development (Vugt *et al.,* 2022). This study would help to solve these problems through interactive maternal-infant attachment training of pregnant adolescents; these would help to attain not only maternal identity and satisfaction with motherhood role but also improve infant survival, cognitive and social development. Findings of the study would inform the policies on the need to integrate attachment training program into the routine antenatal care thereby leading to improved maternal-infant bonding and child survival. Therefore, this study aimed to assess the effect of interactive attachment training programs on postnatal mother-infant bonding of pregnant adolescents attending antenatal clinics at PHCs in Zaria Metropolis of Kaduna state.

2.0 Materials and methods

The study is a quasi-experimental study design that adopted a controlled interrupted time series (CITS), approach. CITS design involves a set of observations on a population, taken repeatedly over time before and after an intervention to evaluate the impact and sustainability of the intervention (Ewusie *et al.,* 2017). The design therefore allows for the evaluation of knowledge and practice of maternal-infant attachment among the participants from the third trimester of pregnancy through their various postpartum visits to PHCs for immunization up to the sixth month postpartum.

2.1 Target population

The target population for this study were pregnant adolescents who received antenatal care at PHCs in Zaria Metropolis during the study period. It extends and covers the women and their infants up to the sixth month postpartum. They were 1,230 in number, 613 for the study and 617 for the control group (Medical Record in PHCs, 2020).

Table 1: Target Population of the Studied Groups

Study Group			**Control Group**		
PHC	**Pregnant adolescent on ANC**	**Sample size**	**PHC**	**Pregnant adolescent on ANC**	**Sample size**
Samaru	156	39	Kwata	218	54
Jama'ah, zango	37	09	Unguwan Dankali	33	08
Chikaji	26	06	Unguwan Alkali	38	09
Abdu Kwari	36	09	Babbandodo	279	68
Tudun-Wada	358	88	Rimin Doko	49	12
Total	**613**	**151**		**617**	**151**

2.2 Sample size and sampling technique

The sample size of 302 participants; 151 for each group was determined by using Colton, (1974); and Daly *et al.,* (1991)'s formula for the comparison of two independent populations.

$$\Pi = \left\{\frac{2(Z\alpha + Z\beta)\sigma}{u_1 - u_L}\right\}^2 \qquad \text{(i)}$$

Parameters are:
n = minimum required sample size per each group
σ = estimated population standard deviation = 3
u_1= population mean of study group = 16.3
u_2 = population mean of control group = 15.28
u_1-u_2 = Difference between the two population means = 1.02
Z_α = Standard z- value at the desired level of significant = 1.96 at 5% level of significant
Z_β = Standard z- value at the desired power = 0.84 at 80% power

$$\Pi = \left\{\frac{2(1.96 + 0.84)3}{1.02}\right\}^2$$

$$n = \frac{141.12}{1.0404}$$

$$= 135.6401$$

n = 136 per group

Jain *et al.* (2015), stated that 10-20% of subjects are required to allow adjustment of other factors such as withdrawals, missing data and loss to follow-up from the study. Based on previous work from a similar intervention study, the researcher expects that 10% of all the participants would be lost to follow-up or would drop out of the study. The number to enroll with attrition rate was calculated using the formula below:

Number to enroll x % retained = desired sample size

$$\text{Number to enroll} = \frac{desire\ sample\ size}{\%\ retained} \qquad \text{(ii)}$$

$$\text{Number to enroll} = \frac{136}{0.9}$$

$$= 151 \text{ per group}$$

Therefore, the total sample size with a 10% attrition rate was determined to be 302 for both the study and control groups.

The proportionate sample size per facility was determined using:

$$\text{nth} = \frac{\text{Nth}}{Ntotal} X\ Total\ sample\ size \qquad \text{(iii)}$$

Where, n_{th} = sample size per facility

N_{th} = population size per facility

N_{total} = total population size

A Multistage sampling technique was used. Stage 1: Zaria metropolis was stratified into Sabon Gari LGA (study group) and Zaria LGA (control group). There was a total of 23 (10 from Sabon Gari LGA and 13 from Zaria LGA) functional PHCs that offered comprehensive maternal and child healthcare (MCH) services at the time of the study. Stage 2: five PHCs were randomly selected from each Sabon and Zaria LGAs for study and control groups by simple random sampling technique (balloting). Stage 3: a proportional allocation of participants needed per PHC was done based on the average number of clients that attend the antenatal clinics weekly. Participants per each PHC was determined by adding those who visited the two ANC days per week (booking and subsequent visits). This register formed their population frame from where proportionate allocation was determined. Stage 4: A systematic sampling technique was used to select the required respondents in each PHC; this was done by selecting every n^{th} respondent from the target population frame in each antenatal clinic. The n^{th} (sampling interval) respondent was obtained by dividing the target population by the sample size.

2.3 Instrument for Data Collection

Data were collected using two instruments developed by the researcher: a structured interviewer-administered questionnaire, and an observation checklist. The instruments were developed by the researcher using information gathered from reviewed literature which covered different areas of maternal-infant attachment knowledge and practice. It was translated into the local language (Hausa) by two secondary school Hausa teachers. The first one translated from English to Hausa language for the purpose of adequate and correct communication, and the second translator back-translated it from Hausa version to English to ensure accuracy and consistency; some inconsistencies noted were corrected. In order to establish the reliability of the instruments, the instruments were pre-tested at Muchia and Wuciciri PHCs to identify problems that might be encountered during data collection. The instruments were administered to 32 pregnant adolescents representing approximately 10% of the sample size. Data generated were computed, Cronbach's alpha was used to determine the internal consistency of 0.89 for the interview-administered questionnaire, 0.79 for the observation checklist. The instrument was transformed into a software application called Open Data Kit; which is a software application installed on mobile phones and the same was used by all the research assistants in the place of the paper instrument. The interviewer-administered questionnaire was used to elicit information on demographic characteristics, knowledge of maternal-infant attachment and satisfaction. It contains both open and close-ended questions. An observation checklist was used to elicit information on the practice of maternal-infant attachment among the participants.

2.4 Ethical clearance

The ethical approval to conduct the research was obtained from Ahmadu Bello University with reference number: VC/SAD/STU/32 and Kaduna State Ministry of Health with reference number: MOH/ADM/744/VOL.1/920. Permission from supervising heads of PHCs and individual participant's informed consent were obtained before data collection. Mothers were assured with the use of informed consent forms that the research would pose no risk or hazard to them and their infants, and their participation in the research was voluntary as they could withdraw from it at any time if they wished. Although participants were identified by their names and hospital numbers for the purpose of follow-up (post-test) data collection, However, the names were deleted after data collection and analysis was done without tracing the data to the participants.

2.5 Method of data collection

The data collection process was arranged in three phases as: pre-intervention, intervention and post-intervention.

2.5.1 Pre-intervention

Educational materials (leaflets) containing the main points of instruction on the program and research instruments were prepared. The same was independently translated into the Hausa language for adequate and correct communication. Each PHC was visited, the aim of the study was explained to their unit heads and agreement was made on when to come for the program. Four nursing students and two nurses/midwives/experienced CHEW/CHO from each PHC were trained as research assistants for this study. The formal (i.e., four nursing students) were part-three nursing students from ABUTH School of Nursing and were used throughout the pre-intervention data collection and administration of interventions in the PHCs. The latter (i.e. two nurses/midwives/experienced CHEW/CHO) were from each PHC and were used throughout post-intervention data collection. The researcher and the research assistants were introduced to the respondents, explained the aim of the study and obtained their informed consent to participate. All research assistants were taught on how to administer each question of the instruments in both English and Hausa. All research assistants were also given Open Data Kit (ODK) software application on their mobile phones as instruments for data collection. Data collection processes were mainly conducted in the Hausa language except for very few who didn't understand Hausa that was interviewed in the English language. Baseline (pre-intervention) data were collected from both study and control groups. Participants included in the study were in at least the 24^{th} week of gestation. The data collection process was carried out sequentially from all the PHCs within three weeks based on their days of ANC visit. At each visit, all eligible participants in both study and control groups were interviewed with the questionnaire to assess and evaluate their baseline knowledge of maternal-infant attachment. This study could not establish pre-intervention practice. This was noted during the pilot study when the majority of the participants were primigravidas with little or no experience in maternal-infant attachment practice. Baseline (pre-intervention) data collection per each participant took about 30 minutes, and a period of 20 days was used to collect the baseline data from all the selected PHCs. Pre-intervention data collection process covered a period of 3 weeks.

2.5.2 Intervention

The intervention was given to the study group in a well-ventilated and comfortable room in each PHC during their visits to the routine ANC; it was given in addition to the routine antenatal care. The intervention was only given to participants who came for ANC; they were tracked by their mobile numbers to remind them of their ANC visits and most of the participants were in the same group and often had their visits on the same day. Repeated interventions were done in all the clinics to cover those who missed the first one. The intervention was standardized across all the PHCs by using the same health education training modules for all the participants. The intervention was conducted in two sessions:

The first session involved the introduction and description of details about maternal-infant attachment, including: meaning of maternal-infant attachment, events contributing to its development during pregnancy as follows: planning, approval and acceptance of the pregnancy, appreciation of fetal movements, accepting the fetus as an individual. How to develop maternal-infant attachment during the post-partum period through the following processes: skin-to-skin contact with the infant, early initiation of breastfeeding, new-born massage, involvement in caring for the baby, prompt response to baby's need, eye contact, smiling and playing with the baby. Its benefits were also described as: the foundation for the formation of the child's future behaviors and healthy mental development; essential for social, emotional and cognitive development of a child, enhance positive parenting behaviors of the mother and motivates the mothers to acquire motherhood competence and satisfaction about maternal role. This was presented with the aid of audio-visual materials like slides, videotapes, flip charts and leaflets. The first session took a period of 40 minutes.

The second session was conducted to demonstrate to the mothers how to carry out all the procedures related to maternal-infant attachment. Doll models (of infants well-dressed with cloth, caps and socks and wrapped with flannel) were used in the demonstration. Each of the mothers took a turn to demonstrate and pamphlets were given to them. This took a period of 60 minutes. The interval between the two sessions was fifteen minutes. All mothers in the study group were given educational materials (leaflets) after the training, these contained the main points of instruction of the program and diagrams. In addition to the leaflets, the materials used for the programs were sent to their phones; since having a phone is one of the inclusion criteria. They were also given the principal investigator's phone number for follow-up calls where necessary for any clarifications. Mothers in the control group were only exposed to routine antenatal care. PHCs of the study group were visited for the interventions weekly in a sequential manner based on their ANC days until all were covered.

2.5.3 Post-intervention

CITS design was used to determine the effect of the training program on knowledge, practice and satisfaction of the participants. This involved assessment and evaluation of the effect of the intervention on both groups at various stages from pregnancy to the sixth month postpartum (i.e. during pregnancy (pre-intervention); at 1st week, 6th week, 10th week, 14th week and at 6th month postpartum (post-intervention). Posttest data collection was in five-time series as follows: at the first week during BCG immunization, the 6th week during Penta 1, the immunization visits on the first, sixth, tenth and fourteenth weeks and at the sixth month postpartum. Post-test data on knowledge and satisfaction were collected using the same interviewer-administered questionnaire used during pre-test data while observation checklist was used for practice. The impact of the training was assessed using their life babies. The effect was evaluated by comparing post intervention knowledge and practice of the study group with the control group. intervention training was given during the antenatal period using a doll model; but at the post-test, the Post-test data collection covered both study and control groups. All data were collected using the ODK and were sent to the cloud where it was collated for analysis. The data collection process lasted for 12 months, from June 2020 to May 2021. 10th week at Penta 2, the 14th week at Penta 3 and at 6th month postpartum during measles/Vitamin A immunization. Posttest data was collected by the two trained nurses/midwives/experienced CHEW/CHO from each PHC. The data was collected from mothers individually based on their time of delivery and days of immunization visits. This phase took place in each PHC during

2.6 Method of data analysis

Data were analyzed descriptively and inferentially as appropriate using Microsoft Excel and IBM SPSS (version 22) statistical packages. Frequencies, percentages, mean and standard deviation were used to describe respondents' demographic characteristics and the results were presented in tables. Chi-square, independent sample t-test and paired sample t-test were used to test the effect and line charts were used to show the trend of the effect of the program up to the sixth month postpartum. A total of 302 respondents participated in the study;

151 each for both the study and control groups. 287(95%), 284(94%), 278(92%), 275(91%) and 272(90%) responses were documented in the first week, sixth week, tenth week, fourteenth week and 6 months postpartum respectively. The remaining were lost during the follow-up of the selected respondents.

3.0 Results

The prevalence of adolescent motherhood in the study area at the time of the study was 254/1000 women and they started their motherhood at middle adolescence (15-19years) There was no significant difference in the level of knowledge of maternal-infant attachment between the study and control groups before the intervention There was statistically significant difference in the level of knowledge of study group before and after the intervention The study showed statistically significant difference between the level of knowledge of study and control groups after the intervention The study presented statistically significant difference in the level of practice of maternal-infant attachment between study and control groups after the intervention Mothers in the study group were more satisfied with the maternal role than those in control group after the intervention. The intervention program has greatly improved and sustained the knowledge and practice of maternal-infant attachment of the study group participants over a long period of time.

Table 2 presents the socio-demographic characteristics of 302 respondents who participated in the study. The finding showed no statistically significant difference in all socio-demographic characteristics between the study and control groups, this confirmed the homogeneity of the groups. Their age ranged from 15 to 19 years, with a mean age of 17.93 ± 1.63 years and 17.95 ± 1.61 years for the study and control groups respectively. There is no significant difference between the age of respondents in study and control groups (p-value = 0.714). The respondents were predominantly Hausa (p-value = 0.165) and of Islam faith (p-value = 0.562). The majority (99.34% for the study and 98.68% for control groups) (p-value =0.562) are married. So also, educational attainment is similar between the groups (p-value = 0.952) in which some (47.68% and 43.71%) in the study and control groups respectively completed primary education, 25.17% in both groups completed secondary education meanwhile (25.83% and 29.80%) in study and control groups respectively had no formal education.

Table 2: Socio-Demographic Characteristics of the Studied Groups

Item	**Study (n= 151)**		**Control (n = 151)**		**Test**
	F	%	F	%	
Age group (years)					
15-17(middle adolescent)	49	32.45	52	34.44	$X^2 = 0.134$ P = 0.714
18-19 (late adolescent)	102	67.55	99	65.56	
Mean age	17.93 ± 1.63 years		17.95 ± 1.61 years		
Ethnic group					
Hausa	139	92.05	144	95.36	$X^2 = 5.088$
Fulani	6	3.97	6	3.97	P= 0.165
Yoruba	1	0.66	1	0.66	
Others	5	3.30	-	-	
Religion					
Islam	149	98.68	150	99.34	$X^2 = 0.337$
Christianity	2	1.32	1	0.66	P = 0.562
Marital status					$X^2 = 0.337$
Married	150	99.34	149	98.68	

Single	1	0.66	2	1.32	P = 0.562
Highest education attained					$X^2 = 0.689$
Tertiary education completed	2	1.32	2	1.32	P = 0.952
Secondary education completed	38	25.17	38	25.17	
Primary education completed	72	47.68	66	43.71	
No formal education	39	25.83	45	29.80	

Table 3 presents the knowledge of maternal-infant attachment of the studied groups before and after the intervention. The aggregate mean scores of the study and control groups before the intervention are 1.9139±1.0705 and 1.8212 ±1.1378 with t-test and P-values of 0.729 and 0.466 respectively. This implies that no statistically significant difference in the knowledge of the studied groups before the intervention. However, after the intervention, the aggregate mean scores of the study and control groups are 2.8873±0.4310 and 1.7676±0.8725 with t-test and P-values of 13.711 and <0.001 respectively. This implies there is a statistically significant difference in the knowledge of the studied groups after the intervention.

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Table 3: Knowledge of Maternal-Infant Attachment Before and After the Intervention

Knowledge of maternal-infant attachment	**Before**		**After**	
	Study (n=151)	Control (n=151)	Study (136)	Control (136)
Mean ± SD	1.9139 ±1.0705	1.8212 ±1.1378	2.8873±0.4310	1.7676±0.8725
t-value	0.729		13.711	
P-value	0.466		<0.001	

Table 4: Knowledge of Maternal-Infant Attachment Within the Study Group

Knowledge of maternal-infant attachment	**Study group**	
	Before (n=151)	After (136)
Mean ± SD	1.8529±1.0923	3.000±0.001
t-value	12.247	
P-value	<0.001	

Table 4 presents the knowledge of maternal-infant attachment within the study group. The aggregate mean scores before and after the intervention are 1.8529±1.0923 and 3.000±0.001 with t-test and P-values of 12.247

and <0.001 respectively. This implies a statistically significant difference in the knowledge before and after the intervention.

Table 5 presents the knowledge of maternal-infant attachment within the control group. The aggregate mean scores before and after the intervention are 1.7279±1.1383 and 1.7353±0.8627 with t-test and P-values of 0.057 and 0.955 respectively. This implies that no statistically significant difference in the knowledge before and after the intervention.

Table 5: Knowledge Of Maternal-Infant Attachment Within the Control Group

Knowledge of maternal-infant attachment	**Control group**	
	Before (n=151)	**After (136)**
Mean ± SD	1.7279±1.1383	1.7353±0.8627
t-value	0.057	
P-value	0.955	

Figure 1 presents the line chart showing the effect of the intervention on knowledge over six months postpartum. Both the study and control groups have almost the same baseline mean knowledge before the intervention. After the intervention, there was a great increase in the knowledge in the study group which was steady throughout observation. However, for the control group, there was a slight and gradual increase in knowledge which was maintained till the end of the observation. By implication, the intervention program has greatly improved and sustained the knowledge of maternal-infant attachment over a long period. The result also implied that some changes can occur due to events other than the intervention; this was evidence from slight increase in knowledge in control group. Part of the strength of this design is that it can distinguish the impact of the intervention from the secular trend (i.e. the change that occurs in the absence of the intervention); which can be observed from the groups in which some levels of knowledge increase was observed in the control group which was slight and minimal compared to the high level in study group.

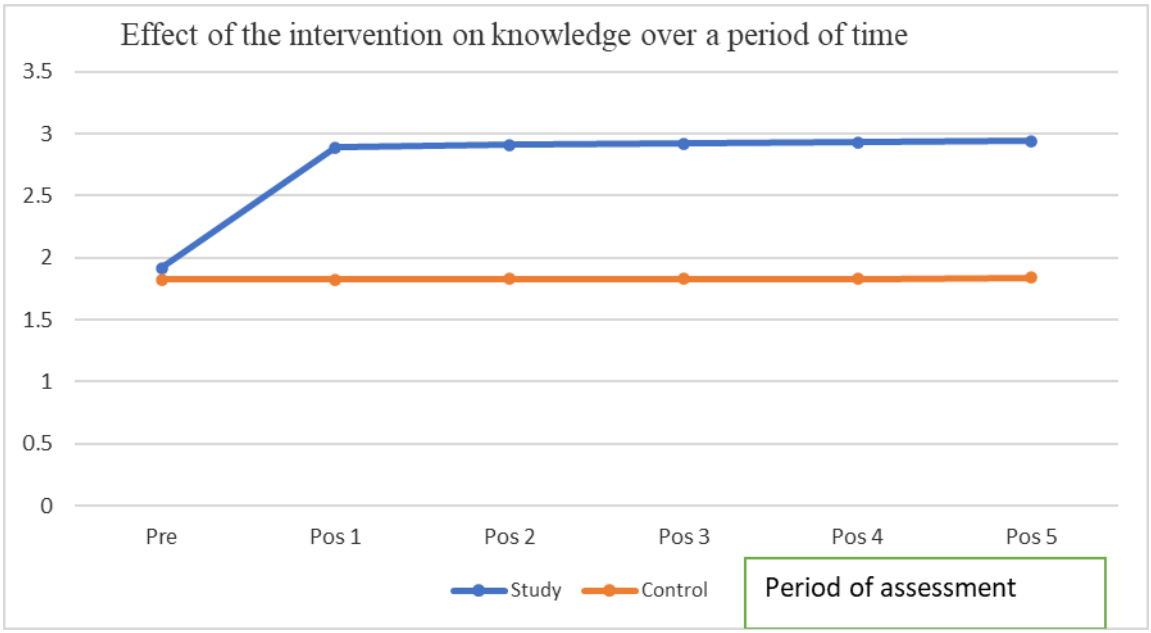

Figure 1: Line Chart Showing the Effect of The Intervention on Knowledge Over Six Months Postpartum

Table 6: Practice of Maternal-Infant Attachment after the Intervention

Practice of maternal-infant attachment	**After**	
	Study (136)	**Control (136)**
Mean ± SD	9.45±1.41	4.58±0.94
t-value	33.54	
P-value	<0.001	

Table 6 presents the practice of maternal-infant attachment of the studied groups after the intervention. The aggregate mean scores of the study and control groups are 9.4485±1.4080 and 4.5809±0.9393 with t-test and P-values of 33.538 and <0.001 respectively. This implies a statistically significant difference in the practice of the studied groups after the intervention.

Figure 2 presents the line chart showing the effect of the intervention on practice over six months postpartum. After the intervention, there was a great improvement in the practice in the study group which was steady throughout the period of observation. However, for the control group, there was a slight and gradual increase in practice. By implication, the intervention program has improved and sustained the optimal practice of maternal-infant attachment among mothers in the study group over a long period. They have a high tendency to maintain the optimal practice in their subsequent deliveries only needs to be updated by continuous health education.

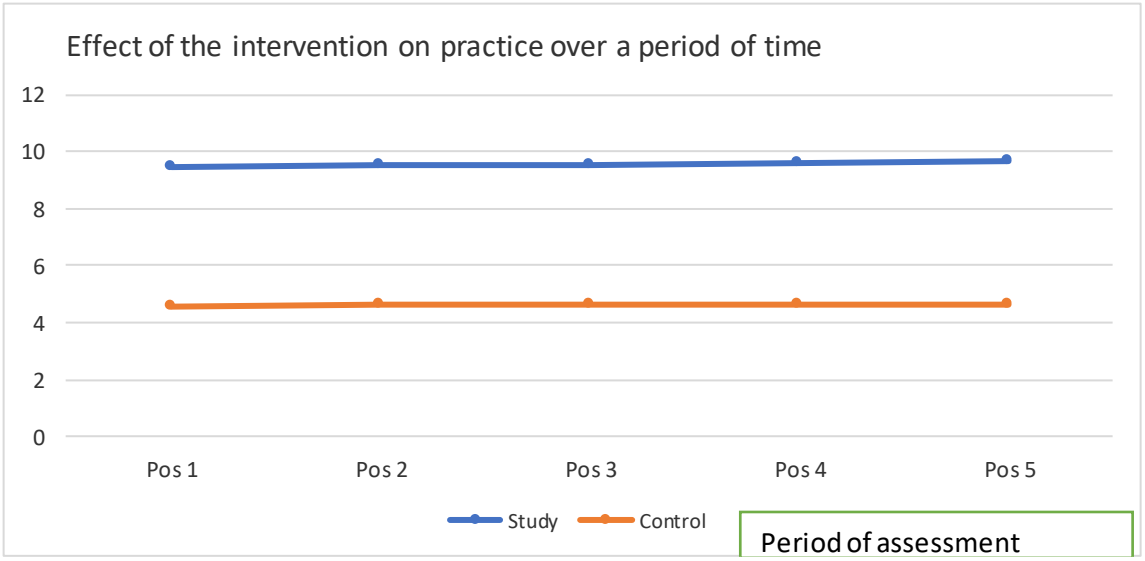

Figure 2: Line Chart Showing the Effect of The Intervention on Practice Over Six Months Postpartum

Table 7 presents the satisfaction of the studied groups after the intervention. The aggregate mean scores of the study and control groups are 9.02±0.42 and 6.61±0.92 with t-test and P-values of 27.43 and <0.001 respectively. This implies a statistically significant difference in the satisfaction of the studied groups after the intervention.

Table 7: Satisfaction of Studied Groups After the Intervention

Satisfaction of maternal-infant attachment	After	
	Study (136)	**Control (136)**
Mean ± SD	9.0221±0.4298	6.6176±0.9274
t-value	**27.432**	
P-value	<0.001	

4.0 Discussions

Maternal-infant attachment is the process of formation of a love bond between the mother and her infant which is essential for social and emotional development, positive parenting behaviors and improved cognitive ability of a child (Darvishvand *et al.* 2018). Building attachment toward an infant contributes to the process of maternal role attainment in a way that motivates the mother for better care giving behaviors (Kim and Tak, 2015). The cultural attitude and belief of shyness ('kunyan') in northern Nigeria which must be demonstrated by primiparas can reduce the level of maternal-infant attachment among adolescent mothers. Finding of this study showed a low level of knowledge of maternal-infant attachment among the study and control groups before the intervention; this implies that many of the young mothers lack knowledge of maternal-infant attachment which can expose their infants to the risk of behavioral problems, failure to thrive, poor social and academic performance, risk of negligence and exploitation. These problems can therefore be prevented through health education of young mothers. However, after the educational program, the finding revealed the highest mean scores of knowledge among the respondents in the study group and statistically significant differences between the groups throughout the stages of the post-test. This implies that the interactive training program has really improved and sustained their knowledge of maternal-infant attachment. This finding can result in the practice of better parenting among the young mothers leading to social and cognitive development in their infants as well as motherhood competence and satisfaction. This finding accords the results of Jkachn *et al.* (2006) in Korea which showed significantly higher maternal-infant attachment among mothers in the study group than those in control group but contrary to that of Doaltabadi and Amiri-Farahani, (2021) in Iran that confirmed no statistically significant difference between the three groups after the educational intervention in terms of the mother-infant attachment score for both intention-to-treat and per- protocol analysis. This could be attributed to the fact that the intervention training was targeted at their spouses and that was why the intervention groups (in-person and virtual education) of spouses improved statistically than their respective control groups; but for the mothers, all of them in both the study and control groups had equal training. The finding of this current study indicates that more adolescent mothers were better educated about mother-infant attachment which could result in full implementation and practice of maternal-infant bonding, hence cognitive, social and emotionally-stable future generation. Also, after the program, mothers' relationship with their infants, mothers' responses to infants' needs and infants' cooperation with the mothers were observed; the study revealed optimal practice of mother-infant attachment in the study group and statistically significant differences between the study and control groups throughout the stages of the post-test. This implies the educational program has improved the practice of maternal-infant attachment of the adolescent mothers and their infants. Finding of the current study is in accordance with the result of a study in Korea by Jkachn *et al.* (2006) which revealed significantly higher maternal-infant attachment practice among mothers in the study group than those in control group; meanwhile contrary to the study in Iran by Doaltabadi and Amiri-Farahani, (2021) who discovered statistically significant difference between the two groups of study and control in terms of father-infant attachment but no statistically significant difference in terms of the mother-infant attachment; the reason being attributed to the fact that the intervention was targeted at their spouses. Finally, developing a sense of satisfaction in the maternal role is a key indicator of maternal role adaptation which has a significant impact on the quality of parenting behaviors and the healthy development of the child. Findings of this study showed that more mothers in the study than the control group were satisfied with the mother-infant bonding experience and a statistically significant difference existed between the study and control groups at the sixth month postpartum.

This finding is similar to the result of a descriptive study by Awaliyah *et al.* (2019) in Indonesia where maternal satisfaction was only similar to the control group of the current study. Hence, maternal-infant attachment intervention program can be integrated into routine antenatal care for all pregnant adolescents across regions in Nigeria.

5. Conclusion

Based on the findings of this study, it was concluded that the adolescent mothers who were subjected to the training program had improved knowledge, practice and satisfaction at the posttest than those in the control group. Hence the need for repeating the study in other regions of Nigeria. Likewise, the study can be repeated in rural and more remote areas to establish variations in the prevalence of adolescent motherhood and outcome of the intervention program.

Policy makers should make explicit policies on the need to integrate the program into routine antenatal care. Nurses/midwives should modify health facilities to respond to the needs expressed by adolescent mothers and provide healthcare services in a friendly.

It is recommended that technical training and health education of all pregnant adolescents by nurses/midwives on maternal-infant attachment is imperative for these young mothers to attain competence in their motherhood role. Training and supporting all nurses/midwives to provide healthcare services to adolescent mothers in a friendly and appropriate manner and modifying health facilities to respond to the needs expressed by adolescent mothers. Need for scaling up the intervention by integrating the program into routine antenatal care. Government should provide financial support for the program implementation in low-resource settings.

This study has some limitations. The study could not establish the baseline data for the practice of maternal-infant attachment of the respondents because the pretest data collection started during pregnancy and most of them were primigravida; who do not have any experience with maternal infant attachment practice. Attrition was also a challenge in this study because of long term follow-up data collection. The effect of attrition was corrected when the expected attrition rate was added to the calculated sample size. Self-report bias is another limitation in which participants may not give exact reports of their experiences.

Conflict of interest

The authors declared that there is no conflict of interest

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References

Akter, M. (2019). Physical and Psychological Vulnerability of Adolescents during Pregnancy Period as Well as Post Traumatic Stress and Depression after Child Birth. Open Journal of Geosciences. 7(1):170–177. https://doi.org/10.4236/jss.2019.71015

Bretherton, I. (1992). *The origins of attachment theory : John Bowlby and Mary Ainsworth*. 431–471.

Darvishvand, M., Rahebi, S. M. and Khalesi, Z. B. (2018). Factors related to maternal-infant attachment. Shiraz E Medical Journal, *19*(12). https://doi.org/10.5812/semj.80369

Doaltabadi, Z. and Amiri-Farahani, L. (2021). The effect of in-person and virtual prenatal care education of the spouses of primiparous women on the father and mother ' s attachment to infant : a quasi-experimental and controlled study. Trials. 22:588.

Ewusie, J. E., Blondal, E., Soobiah, C., Beyene, J., Thabane, L., Straus, S. E. and Hamid, J. S. (2017). *Methods , applications , interpretations and challenges of interrupted time series (ITS) data : protocol for a scoping review*. 1–4. https://doi.org/10.1136/bmjopen-2017-016018

Firk, C., Dahmen, B., Lehmann, C., Niessen, A., Koslowski, J., Rauch, G., Schwarte, R., Stich, K., Konrad, K., & Herpertz-dahlmann, B. (2015). A mother-child intervention program in adolescent mothers and their children to improve maternal sensitivity , child responsiveness and child development (the TeeMo study): study protocol for a randomized controlled trial. Trials. 16:230. https://doi.org/10.1186/s13063-015-0747-5

Kim, A. R. (2015). *Maternal Role Development in Neonatal Intensive Care Unit Graduate 신생아 집중치료실 퇴원 후 미숙아 영아 어머니의 모성 역할 발달 Maternal Role Development in Neonatal Intensive Care Unit Graduate Mothers of Premature Infant*. *March 2016*. https://doi.org/10.4069/kjwhn.2015.21.4.308

Kim, Ah R, Tak, Y. R., Park, H. and Lee, H. J. (2018). Psychosocial Determinants of Maternal Role Development in Mothers of the Premature Infants , among Korean Married Women : The Roles of Attachment , Identity , and Marital Intimacy. Journal of Pediatrics and Mother Care. 1–7.

King, B., Fallon, B., Goulden, A., Connor, C. O. and Filippelli, J. (2019). What Constitutes Risk of Future Maltreatment Among Young Mothers ? An Examination of Child Protection Investigations in Ontario , Canada. https://doi.org/10.1177/1044389419847319

Kobra, S. and Kohan, S. (2017). Maternal-Fetal Attachment : What We Know and What We Need to Know. International Journal of Pregnancy and Childbirth. 2(5):146-148. https://doi.org/10.15406/ipcb.2017.02.00038

Memchoubi, K. (2020). *Factors affecting the maternal-fetal Attachment during pregnancy*. Mansoura Nursing Journal. 8(11):1–7.

Vugt, E., Loeber, R. and Pardini, D. (2022). Why is young maternal age at fi rst childbirth a risk factor for persistent delinquency in their male offspring ? Examining the role of family and parenting factors. Criminal Behaviour and Mental Health. 26(5):322-335. https://doi.org/10.1002/cbm