

Effectiveness of Hoffman's Exercise on the Level of Breastfeeding among Primiparous Women with Inverted Nipple

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Abstract

Background: Breastfeeding is one of the most natural, beneficial and ideal form for feeding newborns to promote their healthy growth and development as well as for better maternal health. Some mothers facing the problem of nipple inversion depleting them of being able to feed their babies as well as taking its advantages.

Aim: this study aimed to evaluate the effectiveness of Hoffman's exercise on the level of breastfeeding among primiparous women with inverted nipple.

Methods: A quasi-experimental research design was conducted at a private antenatal clinic at Mansoura City, Dakahlia Governorate, Egypt. A non-probability purposive sample of 110 pregnant women was allocated either to the control group who received the routine antenatal care or to the intervention group who practiced Hoffman's exercise. Data were collected using a structured interview schedule, LATCH and Likert scales. **Results:** More than half (58.2%) of the subjects in intervention group had good level of breast feeding compared to 7,3 % in the control group with statistical significant difference among both groups ($p < 0.001$). Also about 34,5% and 29,1% of the subjects in the intervention group were either strongly satisfied or satisfied respectively compared to only 3,6% and 5,5% of the control group on the same scale. **Conclusion:** The current study hypotheses were accepted where Hoffman's exercise was an effective intervention for managing inverted nipple, improving level of breastfeeding and is associated with higher satisfaction level with breastfeeding in the intervention group compared to the control group. **Recommendations:** The current study recommended that, Hoffman's exercise can be integrated into nursing care practices for managing inverted nipples among primiparous women.

Keywords: Breast feeding, Hoffman's exercise, Inverted nipple.

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Introduction

Breastfeeding is crucial for maternal health and infant growth since breast milk is the most ideally balanced source of nutrition as it provides a combination of nutrients and immunological factors that can't be replicated. It also decreases the risk of maternal bleeding, chronic

conditions such as type 2 diabetes mellitus, obesity and the risk of breast and ovarian cancer (Abdulahi, Fretheim and Magnus. 2018; Gupta, Sharma , Ekka & Verma. 2018).

Several studies reported that, the initial breastfeeding is a vital experience for the mother and her baby because it

acts as reinforces for subsequent feedings, improves infant's sucking reflex and feeding pattern as well as improves the mother's self-esteem. Also, it has been proven that, mothers who fed their newborns within the first hour after delivery have longer breast feeding duration and have more positive experience and satisfaction than women who breast fed for the first time at sixteen hours or more after delivery (Senna et al., 2020; Bagal, Salunkhe, Salunkhe, Kakade, Mohite. 2017; Godfrey, 2015).

The incidence and prevalence rates of breastfeeding are poor in most parts of the world despite the advancements in scientific knowledge related to the benefits of breastfeeding for the health of children and mothers. A recent WHO commissioned publication provided a complete information on 127 low and middle-income countries and 37 high-income countries showed that, the prevalence of early initiation of breastfeeding is less than 50%, although more prevalent in low and middle-income settings, however, breastfeeding is uncommon in more developed countries (Thomas. 2016; Victora, Bahl, Barros, França, Horton, Krasevec et al., 2016).

In Egypt, breastfeeding practices are not always sufficient, data from the Egyptian demographic and health survey revealed that, only four out of ten children under the age of 6 months were exclusively breastfed (Elsayed & Al-Dossary, 2018). Another Egyptian study found that, the level of breastfeeding is greatly influenced by nipple problems especially among primiparous mothers. Those mothers are not able to breastfeed

their babies because they could not latch effectively despite assistance with the positioning and latching technique as they didn't receive any antenatal evaluation or counseling regarding their nipple problem (Hegazy, Abdelaziz, Fahmy, Shaer. 2015).

Successful breastfeeding relies on correct positioning of both the mother and her baby along with baby's attachment to mother's breast, thereby improving suckling which in turn promotes the production of milk thus increasing the duration of breastfeeding (Mostafa, Salem & Badr. 2019; Gupta, Sharma, Ekka & Verma. 2018; Tella, Guruvare, Hebbar, Adiga, Rai. 2016). However, anatomical breast variations including large breast, large nipple, flat and inverted nipple can serve as obstacles for effective baby's latching on to the breast thus successful breastfeeding is being hard to be achieved (Bagal, Salunkhe, Salunkhe, Kakade, Mohite, 2017).

Nipple inversion represents a major concern for primiparous women who intended to breastfed their babies because it is difficult for the baby to latch on for feeding (Kaur, Saini, Sharma, 2020). It's defined as a slit or a hole in the breast at the location of the nipple caused by adhesions at the base of the nipple that bind the skin to the underlying tissue and may be present on one or both sides. Such problem may be related to a congenital defect, infection in the ducts or scarring from a previous breast surgery. However, inverted nipples may lead to functional problems such as irritation, rash, discomfort and impede the ability to breast-feed (Nabulsi, Ghanem, Abou-Jaoude,

Khalil, 2019). Inverted nipples have been treated through using different strategies as inverted syringe, rubber band and breast shells (**WHO, 2018**).

Another strategy for managing such problem is Hoffman's exercise. This is a manual exercise that can help break the nipple base adhesions that keep it inverted. During this exercise, the thumbs of both hands are placed opposite to each other at the base of the nipple during this exercise then they are gently and firmly pulled away from each other. This is performed by up and down and sideways. This exercise can be practiced up to 5 times a day and can be started at 37 weeks of gestation or immediately after delivery of the newborn in order to draw nipples out and preparing them for breastfeeding (**Hoffman technique, 2016**). Hoffman's exercise is advantageous over other methods that treat nipple inversion because it is safe, simple and painless exercise. In addition, it can be carried out by the mother at any time without need for health care provider (**Kaur, Saini, Sharma, 2020**).

Invariably, nurses can instruct and support women during their pregnancy and postpartum period. They also play a very important role in increasing chances of successful breastfeeding by providing pregnant women with health education programs, examining them during antenatal period for early detection and management of breast or nipple anatomical abnormalities in order to prepare women for feeding their babies later on during postpartum period as well as providing newly mothers with positive support to manage their problems (**Piro & Ahmed 2020; Senna et al., 2020; Bagal , Salunkhe , Salunkhe , Kakade,**

Mohite 2017; Godfrey 2015). In spite of much efforts, the practical issues with breastfeeding remain present and is still growing because most of primiparous women aren't able to breastfeed their babies properly as a result of inverted nipples. So, teaching primiparous women the Hoffman's exercise for managing the inverted nipple will be discussed in this study (**Ponmathi, Mounika, Vijayalakshmi, Sivakumar. 2017**).

Significance of the study

Despite the advantages of breastfeeding, its incidence and duration during the first six months of life are below the international guidelines of exclusive breastfeeding in several countries. A recent systematic analysis about infant mortality found that, the rate of all-cause and infection-related mortality was higher primarily in partially and non-breastfed infants compared to exclusively breastfed infants less than month to five months of age (**Sankar, Chowdhury, Bhandari, Taneja, Martines, Bahl 2015; Unicef, 2013**).

WHO 2018 estimates that, exclusive breastfeeding during the first six months of infant's life will prevent more than 820,000 infant deaths each year (**Johnston, Landers, Noble, Szucs 2012**). An Egyptian study reported that, in very early infancy exclusive breastfeeding is common but not universal in which only breast milk was reported to have been obtained by around 79 percent of infants under two months of age. However, this percentage of exclusively breastfed infants decreases rapidly among infants

at the age of four to five months (Mohamed & Abdullah. 2016).

Among newly breastfeeding mothers, breast variations including flat or inverted nipples serve as major barriers for breastfeeding. These problems cause the baby to be deprived from colostrum benefits. A variety of strategies for correcting it have been developed, taking into account the underlying pathophysiological components and severity. One of these techniques is Hoffman's exercise (Bagal, Salunkhe, Salunkhe, Kakade, Mohite 2017; Dash 2017; Kang, Yun, Song, Shin 2017). Despite the common recommendations that pregnant women with inverted nipples should perform Hoffman's exercise, doubts have been raised about its efficacy and its use remains controversial (Kaur, Saini, Sharma. 2020). Furthermore, there is a little research on addressing Hoffman's exercise in Egypt. So, this study was designed to assess the effectiveness of Hoffman's exercise on the level of breastfeeding among primiparous women with inverted nipple.

Aim of the study:

This study aimed to evaluate the effectiveness of Hoffman's exercise on the level of breastfeeding among primiparous women with inverted nipple.

Hypotheses of the study:

To accomplish the current research aim, two hypotheses were tested;

Hypothesis I: Primiparous women with inverted nipple who perform Hoffman's exercise during pregnancy

exhibit higher scores of LATCH scale on the level of breastfeeding than those who do not.

Hypothesis II: Primiparous women with inverted nipple who practice Hoffman's exercise during pregnancy are highly satisfied with the level of breastfeeding than those who do not.

Subjects and Method:

Study design

A quasi-experimental design was used in this study. The effect of the independent variable (i.e., Hoffman's Exercise) on the dependent variable (i.e., the level of breast feeding) was assessed in this study.

Study setting

This study was conducted at a private antenatal clinic at Mansoura City, Dakahlia Governorate, Egypt. It consists of one floor divided into five parts; reception section, an examination room, operating room, postpartum room and waiting room for women with adequate number of seats where the researchers interviewed the recruited women to conduct this study. The clinic's diagnostic and therapeutic services are offered for women at regular base from Saturday till Wednesday at 2 p.m. to 10 p.m.

Sampling

A non-probability purposive sample of 110 pregnant women with inverted nipple was recruited from the previously mentioned setting during the period from the beginning of June to the end of November 2020. The technique of the sample collection depended on fulfilling the following inclusion criteria: (1)

primiparous women, (2) gestational age at 37 weeks or more, (3) had at least one inverted or non-protractile nipple with grades 1 or 2, (4) singleton pregnancy, (5) intending to breast feed their babies and (6) no history of surgery affecting the nipple or areola while excluded from this study, women with grade 3 inverted nipples and maternal medical conditions that may interfere with breastfeeding (breast abscess, mastitis, and active herpes simplex virus infection), and presence of neonatal congenital anomalies as cleft lip, cleft palate and tongue tie.

Sample size calculation:

Based on data from previous study by **Kaur et al., (2020)** investigated the efficacy of Hoffman's exercise on breastfeeding level among pregnant women with nipple problems, considering level of significance of 5%, and power of study of 80% and by using the following formula: $n = [(Z\alpha/2 + Z\beta)^2 \times \{2(SD)^2\}] / (\text{mean difference between the two groups})^2$ where SD = standard deviation $Z\alpha/2$: This depends on level of significance, for 5% this is 1.96 $Z\beta$: This depends on power, for 80% this is 0.84. Therefore, $n = [(1.96 + 0.84)^2 \times \{2(1.12)^2\}] / (0.6)^2 = 55$. Based on the previously mentioned formula, the sample size required per group was 55 pregnant women.

Recruitment of the sample:

To avoid pollution of the collected data, data were collected from the control group then the intervention group till finishing the required number per each group. About 116 eligible pregnant women were invited to participate in the current research; 6

pregnant women who fulfilled the inclusion criteria refused to share in the study because they were embarrassed to discuss such personal information thus excluded from the sample leaving 110 eligible pregnant women allocated either to the control or to the intervention group (n=55 per each group), a number of 8 pregnant women in the intervention group were missed during the follow up but they were replaced. The statistical analysis was done on 110 subjects. *Flowchart of the study sample indicated in Figure 1.*

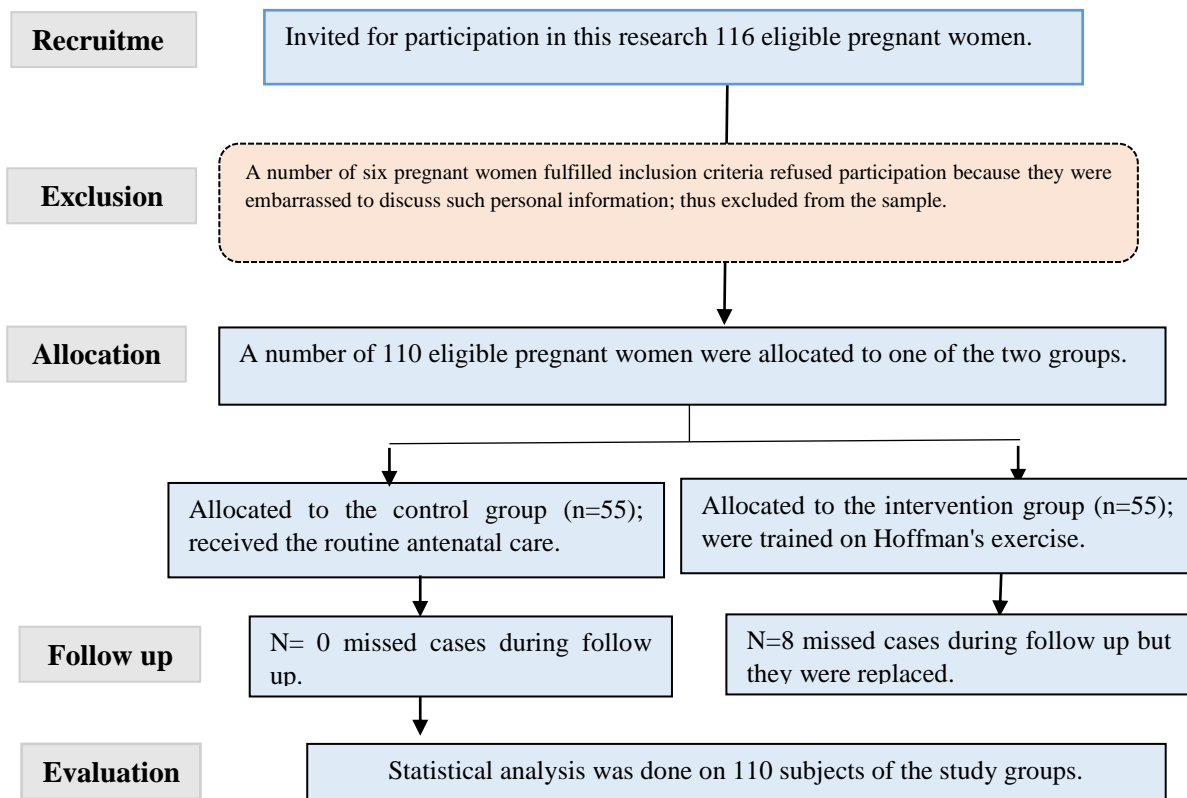


Figure1. Flow chart of the participation in the study

Tools of data collection:

To attain the aim of this study, three tools were utilized for collection of data; a structured interview schedule, LATCH Scale and Likert scale.

Tool (I): A Structured interview schedule

It was designed by the researchers; it included the basic demographic data as age, educational level, occupation, residential area, type of family and family income.

Tool II. LATCH Scale

It was adopted from **Jensen et al., (1994)** based on the model of the Apgar

scoring system for breastfeeding charting and evaluation. The letters of the acronym LATCH are five main breastfeeding components identified by: **Letter "L" is for latch** (score zero= no latch is accomplished; score one= repeated attempts to keep the nipple in the mouth while score two= grasping breast tongue down lips flanged, rhythmic sucking). **Letter "A" is for audible swallowing** (score zero= no swallowing; score one= few swallowing with stimulation and score two= spontaneous and intermittent < 24 hrs.old, spontaneous and frequent > 24 hrs.old). **Letter "T" is for nipple type** (score zero= inverted nipple or nipples; score one= for flat while score two= for

everted nipple or nipples). **Letter "C" is for degree of breast or nipple comfort** (score zero= extreme discomfort as engorged breast, cracked nipple, bleeding; score one= mild to moderate discomfort including filling, reddened, small blister or bruises and score two= soft non tender). **Letter "H" is for hold positioning** (score zero= means total dependent on staff for holding baby and breast; score one= for needs some assistance *i.e.* staff holds and then mother takes over and score two= doesn't need assistance to hold baby during feeding. The LATCH score of 7 or higher was considered as successful while score below 7 was considered as unsuccessful. The total score based on APGAR scoring as follow; zero to three refers to poor, four to six means fair and seven to ten is good level of breast feeding.

Tool III. Likert scale

It was adopted from **Likert., (1932)** to assess maternal satisfaction with breastfeeding. It is one dimensional 5-points Likert scale. The cumulative score can range from 1 to 5. Score 1 means very unsatisfied, 2 unsatisfied, 3 refers to not very satisfied, 4 satisfied, while 5 means very satisfied. Higher score suggests greater breastfeeding satisfaction with the used method.

Validity of the tools

The content validity of the developed structured interview schedule was confirmed by a panel of three experts in the maternity nursing specialty before introducing it to the pregnant women. Validation was done to ensure that the questions were

consistently conveyed and carried the anticipated meaning they were prepared for. Their opinions elicited regarding the consistency, accuracy and relevancy of the tools. No modifications were suggested.

Reliability of the tools

The reliability for internal consistency of the LATCH Scale was assessed statistically through Cronbach's alpha coefficient of 0.881 while for satisfaction Likert scale was 0.893, hence the questionnaires were found to be highly reliable.

Pilot study:

A pilot study was applied on 10% (11 pregnant women) of the total study sample to test the objectivity and applicability of the study tools and the feasibility of the research process as well as to estimate the time needed to answer them. Women in the pilot study were excluded from the study.

Ethical considerations:

To conduct this study, an ethical approval letter was obtained from Research Ethics Committee-Faculty of Nursing- Mansoura University and from the director of the private clinic. A written consent was obtained from every woman involved in this research after clarification of its aim and approach. The women were reassured about the confidentiality of the collected data and their right to withdraw from the study at any time. Once the research was completed, the control group received corporation counseling about Hoffman's exercise in order to tackle their problems.

Field work:

The researchers attended the previously mentioned setting three days per week, (Saturday, Monday and Wednesday), from 1 p.m. to 5 p.m. until the calculated sample size of women was obtained. The study was accomplished through three phases: preparatory, implementation and outcome evaluation.

1. Preparatory phase:

The tools for data collection were prepared after massive reviewing of literature then the contents of the educational session about Hoffman's exercise were designed and methods of teaching were determined including Power Point Presentation, illustrative media and Hoffman's exercise brochure in Arabic language.

2. Implementation phase**A. Assessment:**

The researchers interviewed pregnant women, introduced themselves to them, clarified the aim of the research work. Once eligibility for participation was confirmed, the researchers took the participant's written consent to share in this study. The researchers collected data regarding women's general characteristics using the first tool of data collection (a structured interview questionnaire). Thereafter, women's breasts and nipples were examined by the researchers for nipple inversion. If the nipple was situated on a plane below the areola that is, it was considered to be inverted, it has a crater like appearance. Women with inverted nipple or nipples were involved in this study.

B. Procedure:**• Control group**

Women in the control group received routine antenatal care as

dictated by their obstetricians. Health education about breastfeeding techniques, positions and benefits was provided to them.

• Intervention group

The participants allocated to this group were oriented with the educational session contents that were divided into two main parts; the first part discussed the definition of inverted nipple, causes, effect of nipple inversion on the level of breastfeeding. Subjects also were offered health education about the importance and benefits of breastfeeding. The second part of the educational session illustrated management of inverted nipple with Hoffman's exercise. The educational session about Hoffman's exercise technique was provided to them in eight groups of 6-7 women at the waiting room of the private clinic in the form of lectures, group discussion and training with duration of 60 - 90 minutes. Participants were instructed to start Hoffman's exercise at 37 weeks of pregnancy till post-delivery. Hoffman's exercise aims at stretching the nipples by manipulation in which the thumb or the forefingers are positioned close to the inverted nipple, then pressing into the breast tissue quite firmly and gradually pushing the fingers away from the areola. This practice is repeated five times a day in the horizontal plane and then five times in the vertical plane for 5 minutes. At the end of the educational session, the researchers provided the participants with brochure containing the same educational contents that have been discussed during the educational session. Finally, the researchers took the subject's permission to send a weekly reminder on applying Hoffman's exercise using telephone messages or calls.

Outcome evaluation phase:

At this phase, two post intervention evaluations were done; the first evaluation was done at the 1st week after delivery (subjects were evaluated during the first postnatal follow-up visit at the doctor's private clinic), at this time, the difference between the control and intervention groups related to level of breastfeeding and degree of inverted nipple were assessed using LATCH scale. The second evaluation was done at the 8th postpartum week through calling of subjects via phone, thus, the subject's satisfaction with the level of breastfeeding for both groups were assessed using Likert scale.

2.11 Data analysis

All statistical analyses were performed using SPSS for windows version 20.0 (SPSS, Chicago, IL). All continuous data were normally distributed and were expressed in mean \pm standard deviation (SD). Categorical data were expressed in number and percentage. Chi-square test was used for comparison of variables with categorical data. Cronbach's alpha test was performed to test for the internal consistency of the tools used in the study. Statistical significance was set at $p < 0.05$.

Results**Table 1. The general characteristics of studied groups.**

	Control group		Intervention group		Chi square test	
	n=55	%	n=55	%	X ²	P
Age (years)						
20 – 24	20	36.4	19	34.5		
25 – 29	22	40.0	22	40.0		
≥ 30	13	23.6	14	25.5	0.063	0.969
Mean	26.2	± 4.2	26.8	± 4.4	0.732	0.466
\pmSD						
Residence						
Rural	32	58.2	33	60.0		
Urban	23	41.8	22	40.0	0.038	0.846
Educational level						
Illiterate	19	34.5	17	30.9		
Secondary	21	38.2	20	36.4		
Higher	15	27.3	18	32.7	0.408	0.815
Occupation						
House wife	35	63.6	37	67.3		
Working	20	36.4	18	32.7	0.161	0.688
Type of family						
Nuclear	27	49.1	29	52.7		
Joint	28	50.9	26	47.3	0.146	0.703
Monthly income						
Not enough	31	56.4	33	60.0		
Enough	24	43.6	22	40.0	0.149	0.699

Table one presents the socio-demographic characteristics of the studied groups. The mean age of subjects in control and intervention groups was almost similar (26.2 \pm 4.2 and 26.8 \pm 4.4 respectively). The higher percentages of both control and intervention groups had secondary education and were housewives (38.2%, 36.4% and 63.6%, 67.3% respectively). More than half of the control and intervention group were from rural areas (58.2% and 60% respectively). Concerning familial type, more than the half (52.7%) of subjects in intervention group belonged to nuclear family, on the contrary of the control group about 50.9 % of subjects belonged to joint families. Regarding the monthly income of the subjects and their families, data revealed that 56.4% versus 60% of the subjects in the control and intervention groups respectively had insufficient income that barely enough for their living. There was no statistical significant difference among both groups concerning age, residence, educational level, occupation, income and familial type ($p > 0.05$).

Table 2. Comparison of the LATCH breastfeeding scores of the studied groups.

LATCH Categories	Control group						Intervention group						Chi square test	
	Score 0		Score 1		Score 2		Score 0		Score 1		Score 2		X ²	P
	N	%	n	%	N	%	N	%	N	%	N	%		
Latch	28	50.9	17	30.9	10	18.2	5	9.1	20	36.4	30	54.5	26.274	<0.001**
Audible Swallowing	26	47.3	18	32.7	11	20.0	12	21.8	19	34.5	24	43.6	10.013	0.007**
Type of Nipple	29	52.7	13	23.6	13	23.6	8	14.5	12	21.8	35	63.6	22.042	<0.001**
Comfort Level	25	45.5	17	30.9	13	23.6	13	23.6	16	29.1	26	47.3	8.153	0.017*
Hold Positioning	20	36.4	16	29.1	19	34.5	8	14.5	19	34.5	28	50.9	7.123	0.028*

* Statistical Significant at $P < 0.05$

**Highly Statistical Significant at $P < 0.001$

Table two shows comparison of the LATCH breastfeeding scores of the studied groups. Data revealed that, about 18.2% of newborns in the control group eagerly grasped breast to latch on (score 2) compared to 54.5% of newborns in intervention group. As regards to the audible swallowing scores, about 20% versus 43.6% of newborns in the control and intervention groups respectively, had spontaneous and intermittent swallowing more than 24 hours old (score 2).

Regarding the subjects' nipple type, only 23.6% of the subjects in control group had everted nipple compared to 63.6% of the subjects in the intervention group. In the same line, only 23.6% of the subjects had soft non tender breast/nipple in the control group compared to 47.3% in the intervention group. Similarly, 34.5% versus 50.9% of the subjects in control and intervention group respectively, did not need any assistance from staff to hold their babies or during breast feeding. There were highly statistical significant differences among both groups concerning the categories of the LATCH breastfeeding scores ($P < 0.001$).

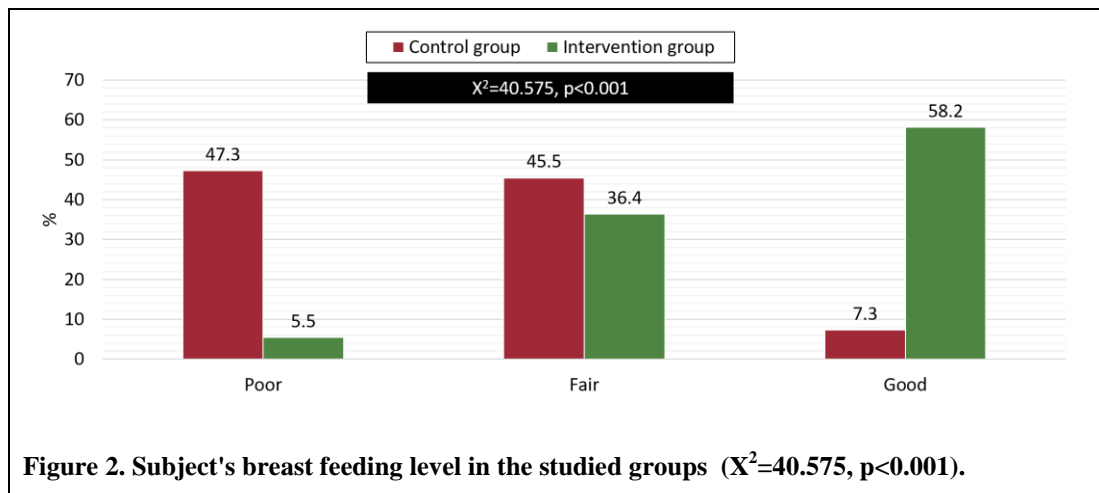


Figure 2. Subject's breast feeding level in the studied groups ($X^2=40.575, p<0.001$).

Figure two shows breast feeding level of subjects in the studied groups at the end of the study. The figure highlighted that, there were highly statistical significant differences among the studied groups regarding the level of breast feeding, with regard to the intervention group had good level for breast feeding (58.2%) compared to 7.3% in the control group ($p<0.001$).

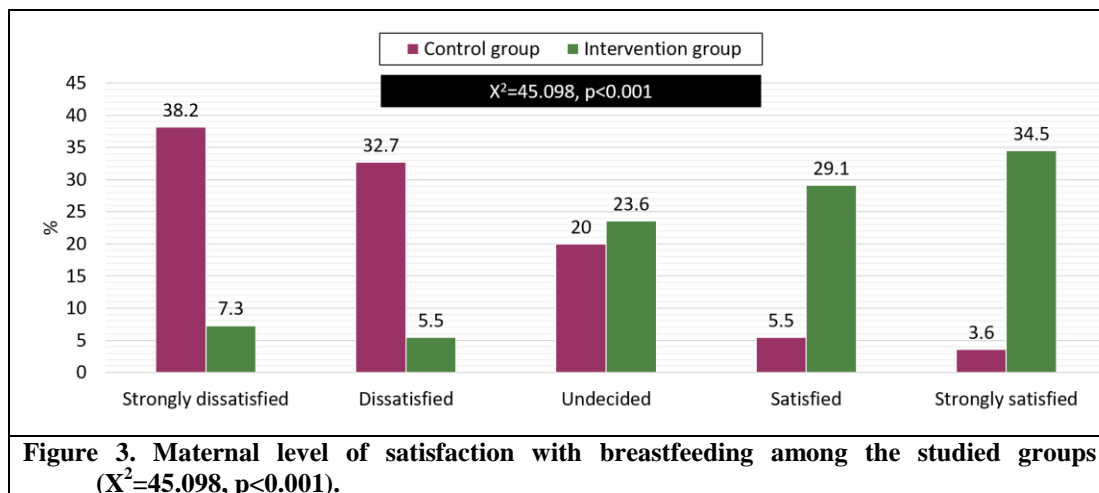


Figure 3. Maternal level of satisfaction with breastfeeding among the studied groups ($X^2=45.098, p<0.001$).

Figure three illustrates the subject's level of satisfaction with breastfeeding among the studied groups. Data showed that, 34.5% and 29.1% of the subjects in the intervention group were either strongly satisfied or satisfied respectively, compared to only 3.6% and 5.5% of the subjects in control group on the same scale. However, differences between both groups were highly significant ($p<0.001$).

Table 3. Association between the mothers' level of breast feeding and the general characteristics of the intervention group.

	Total LATCH						Chi square test	
	Poor (n=3)		Fair (n=20)		Good (n=32)		X ²	P
	n	%	n	%	N	%		
Age (years)								
20 – 24	1	33.3	8	40.0	10	31.2		
25 – 29	2	66.7	10	50.0	10	31.2		
30 or more	0	0.0	2	10.0	12	37.5	6.384	0.172
Residence								
Rural	2	66.7	10	50.0	21	65.6		
Urban	1	33.3	10	50.0	11	34.4	1.311	0.519
Educational level								
Illiterate	1	33.3	11	55.0	5	15.6		
Secondary	2	66.7	6	30.0	12	37.5		
Higher	0	0.0	3	15.0	15	46.9	12.031	0.017*
Occupation								
House wife	2	66.7	17	85.0	18	56.2		
Working	1	33.3	3	15.0	14	43.8	4.621	0.099
Type of family								
Nuclear	2	66.7	13	65.0	14	43.8		
Joint	1	33.3	7	35.0	18	56.2	2.477	0.290
Monthly income								
Not enough	2	66.7	15	75.0	16	50.0		
Enough	1	33.3	5	25.0	16	50.0	3.264	0.196

* *Statistical Significant at P<0.05*

Table three presents the association between the mother's level of breast feeding and the general characteristics of the subjects in the intervention group. It is clear that, maternal educational level showed a significant association with the level of breast feeding in the intervention group (P=0.017). In contrast there were no statistical significant associations regarding the maternal age, residency, occupation, family type and subject's monthly income in relation to the level of breast feeding.

Discussion

This study aimed to assess the effectiveness of Hoffman's exercise on the level of breastfeeding among primiparous women with inverted nipple. This aim was accomplished through the present study findings which revealed that, there was a statistical significant increase in both; the scores of LATCH scale on the level of breastfeeding and maternal satisfaction with the level of breastfeeding among the subjects in the

intervention group compared to those in the control group. Therefore, the hypothesis of current study "Primiparous women with inverted nipple who perform Hoffman's exercise during pregnancy exhibit higher scores of LATCH scale on the level of breastfeeding and are highly satisfied with the level of breastfeeding than those who do not" were reinforced.

Inverted nipples are common but overlooked problem that delay early initiation and maintenance of exclusive

breastfeeding. Primiparous mothers with inverted nipples are the most vulnerable groups so they must be identified early in pregnancy and provided with adequate breastfeeding support to enable successful breastfeeding. Early detection and management of inverted nipples with simple techniques such as Hoffman's exercise can help mothers to initiate and sustain successful breastfeeding early as much as possible. Considering the effect of Hoffman's exercise on LATCH scores scale for breastfeeding level, the present study findings showed that, there was a significant improvement and higher LATCH scores for breastfeeding level among subjects in the intervention group compared to those in the control group.

Yet, these findings are in agreement with study conducted by **Ponmathi et al. (2017)** to assess the influence of Hoffman's exercise on flat nipple and breastfeeding quality among postpartum women, revealed that, the pinch test was positive for pretest while negative for posttest and there was an improvement in the quality of breast feeding among the Hoffman's group compared to control group. The findings of an interventional study by **Padmavathi (2015)** who tested the efficacy of Hoffman's exercise on breast feeding level among 30 primiparous women with flat or retracted nipples, India, supported the current study results.

Concerning the subject's breastfeeding level in the studied groups, a statistical significant difference was found among the control and intervention groups regarding the level of breast feeding ($p < 0.001$), it's interesting

to notice that the present study finding revealed that, more than half of the subjects in intervention group had good level of breast feeding compared to only 7,3 % of the subjects in the control group. However, the significant improvement in the total latch score on the level of breast feeding after intervention suggesting that, Hoffman's exercise has beneficial effect on managing inverted nipple and promotes successful breast feeding. The current study findings could be explained as Hoffman's exercise works through breaking the adhesions in the fibrous band at the base of the nipple that keep it inverted and made the nipple erect.

The same conclusion was given by Punjab study conducted by **Kaur et al., (2020)** to investigate the efficacy of Hoffman's method on breastfeeding success among sixty pregnant women with nipple problems. The efficacy of Hoffman's exercise on breastfeeding success among the studied groups was highly statistically significant at ($p < 0.001$). Also, more than three quarters of the subjects in the intervention group had low risk on the level of breastfeeding, and one fifth of them was at medium risk with average Mean \pm SD 7.80 \pm 1.12 (via Christi breastfeeding scale). On the other hand, the majority of subjects in the control group were at medium risk on the level of breastfeeding, compared to 13.3% had low risk with average Mean \pm SD 4.53 \pm 1.25. Likewise, a study by **Padmavathi (2015)** found that, more than three quarters of subject's in control group were at medium risk and one fifth was at low risk while, in intervention group three quartets of subjects were in

low risk and one quarter was in medium risk for breast feeding.

Another study was conducted in Kanyakumari District, using pretest and posttest design among thirty postnatal mothers to investigate the efficacy of Hoffman's technique on breastfeeding level of postpartum women having nipple problems. There was a significant difference in breastfeeding level pretest and posttest. During the pretest, nearly more than two fifth of subjects had inadequate level of breastfeeding. On contrary, there was an improvement after intervention in which nearly half of subjects had adequate breastfeeding level in posttest (**Godfrey, 2014**).

Additionally, the current study finding was supported in a descriptive prospective study at Srilanka by **Amarasena, (2008)** to determine the effectiveness of Hoffman's technique on flat and inverted nipples. The study was conducted among antenatal women. About 52 out of 80 mothers with flat or inverted nipples completed the study. Promising results were reported at the end of the study, with 84.61% of mothers having flat or inverted nipples being corrected before delivery and successfully established lactation.

The current study intervention group was highly satisfied with the level of breastfeeding compared to the control group. However, differences were significant between both groups in which 34,5% and 29,1% of the women in the intervention group were either strongly satisfied or satisfied respectively compared to only 3,6% and 5,5% of the control group on the same scale. This finding could be related to the

psychological comfort that they obtained when they naturally breastfeed their babies and satisfy their maternal instinct as well as improving maternal child bonding that is achieved through breast feeding. Similar results were reported by **Ponmathi et al., (2017)** who found a high satisfaction level of the subjects in Hoffman's group.

Concerning the association between the mother's level of breast feeding and their general characteristics in the intervention group, it is clear that maternal educational level showed a significant association with the level of breast feeding in the intervention group, means that, women with higher educational level had better and higher level of breast feeding ($P=0.017$). In contrast, **Godfery, (2014)** reported that, there wasn't any association between breastfeeding level and maternal level of educational. The current study findings could be explained by, the highly educated women tend to strictly follow and apply the instructions given to them about the exercise compared to those less educated because they are more knowledgeable about the benefits of natural breast feeding for them and their babies. Another explanation is that, the highly educated mothers tend to have broad access to information because they always want to find out health information including successful breastfeeding so that the higher a subject's education, the better their knowledge.

On the other hand, the results of present study indicated that, there was no statistical significant association between the mother's breast feeding level and the maternal age, residence, occupation,

monthly income and their family type. Correspondingly, **Godfery. (2014)** on his study found no association between the breastfeeding level and demographic characteristics of the studied subjects such as age of the mother. Likewise, **Kaur et al. (2020)** reported that, there was no association between sociodemographic factors and breastfeeding level ($p < 0.05$).

The study findings indicated that Hoffman's exercise was an effective technique that promotes breastfeeding levels among mothers with inverted nipples. So, this technique can be practiced by maternity nurses as a part of nursing strategies to manage nipple inversion in various healthcare settings.

Limitation of the study

There were two limitations for the current study work; the first one was lacking of the necessary national and international references so, the researchers had difficulties in discussing the research topic. The second one was in taking the subject's consent to have breast and nipple examination before recruiting them in the study for the sensitivity of such issue from their point of view.

Nursing implications for practice

Nurses working in antenatal care units are subjected to act in response to solve and manage maternal problems that arise during pregnancy and could stand as an obstacle for natural breast feeding after birth. Nurses work through applying measures that help mothers to be prepared for and achieve their primary role as a breastfeed mothers as well as the prevention of breastfeeding complications. Hoffman's exercise is one

of the simplest procedures that protect mothers from developing postnatal complications related to breastfeeding as breast engorgement, mastitis, and or breast abscess because of the benefits of early latching on that decrease the chance of milk stasis. Furthermore, it is a cost effective, noninvasive, easy and safe practice that promotes the level of breast feeding among primiparous women with inverted nipple.

Conclusion and Recommendations

Based on the present study results, the tested hypotheses were accepted where Hoffman's exercise was an effective intervention for managing inverted nipple, improving level of breastfeeding and is associated with higher satisfaction level with breastfeeding in the intervention group compared to the control group. Findings incite the following recommendations:

- Hoffman's exercise can be integrated into nursing care practices for managing inverted nipples among primiparous women.
- Adequate clinical training on Hoffman's exercise can be provided to maternity nursing staff in different health settings.
- In service education program regarding demonstration of Hoffman's exercise can be provided by the nursing personnel to help mothers to gain comfort during antenatal period.
- A comparative analysis between primiparous and multiparous mothers in various settings can be performed similarly.

- Further interventional studies are needed for women with inverted nipples to promote successful establishment and achievement of breastfeeding.

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