

# Effect of Hoffman's Exercise on Breastfeeding Level among Primiparous Women with Flat and Inverted Nipples

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## Abstract

Flat and inverted nipples are common conditions that may negatively affect breastfeeding effectiveness and maternal satisfaction. Hoffman's exercise is a simple, non-invasive technique used to improve nipple protrusion and breastfeeding outcomes. This study aimed to evaluate the effect of Hoffman's exercise on breastfeeding level among primiparous women with flat and inverted nipples. A quasi-experimental research design was conducted at the Obstetrics and Gynecology Outpatient Clinics at Benha University Hospital. A purposive sample of 76 primiparous women was selected and allocated into two equal groups (38 women each). Four tools were used for data collection: a structured interview questionnaire, the Nipple Type and Inversion Grade Assessment Tool, the LATCH Breastfeeding Assessment Tool (LATCH), and the Maternal Breastfeeding Evaluation Scale (MBFES). The results revealed that, after implementing the intervention, the study group demonstrated significantly improved breastfeeding levels and higher maternal satisfaction compared to the control group ( $p < 0.001$ ). A significant positive correlation was found between total breastfeeding level and maternal satisfaction ( $p < 0.001$ ). The findings of the present study indicated that Hoffman's exercise significantly improved breastfeeding levels and increased maternal satisfaction among mothers with flat or inverted nipples during the postpartum period. Integrating Hoffman's exercise into routine maternity nursing care is recommended.

**Keywords** Breastfeeding effectiveness, maternal satisfaction, nipple protrusion, nursing intervention, postpartum women.

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## 1. Introduction

Breastfeeding (BF) is recognized as a global public health priority due to its numerous health benefits for both mothers and infants (**Kiselova et al., 2022**). The World Health Organization (WHO) and the United Nations Children's Fund (UNICEF) recommend initiating breastfeeding within the first hour after birth, exclusively breastfeeding for the first six months, and continuing breastfeeding alongside appropriate complementary feeding from six months up to two years of age or beyond (**WHO, 2024; Jackson et al., 2025**).

Exclusive breastfeeding is a key step toward healthy infants and communities, providing essential benefits for both mothers and babies. Breast milk contains easily digested proteins and endogenous peptides, which help enhance immunity, cognitive development, and gut maturation, promote infant development, and support healthy microbial colonization (**Nixarlidou et al., 2024**). Long-term benefits of breast milk include decreased risk for asthma, gastrointestinal infections, and adult diabetes. For mothers, breastfeeding contributes to postpartum weight reduction, delayed return of fertility, and reduced risks of diabetes, cardiovascular diseases, elevated blood cholesterol, and certain types of cancer (**Sokar, 2025**).

The efficacy of breastfeeding is enhanced by the correct positioning of the neonate to the mother's breast and the proper latch. Nipple abnormalities, including long, short, flat, inverted, and fractured nipples, as well as anatomical breast variations, can function as obstacles to effective lactation (**Preethi et al., 2024**).

Inverted nipples affect about 10% of women and are considered a significant barrier to successful breastfeeding. Although the condition is not life-threatening, but the condition can cause psychological distress,

functional difficulties and cosmetic concerns (**Qi et al., 2024**).

The management of inverted and flat nipples depends on the severity of the inversion. Han and Hong classified inverted nipples into three grades: Grade one, characterized by minimal fibrosis, in which the nipple can be easily everted and maintains its projection; Grade two, defined by moderate fibrosis, in which the nipple can be manually everted but does not sustain projection; and Grade three, marked by severe fibrosis, in which the nipple cannot be manually everted. Non-surgical methods are commonly performed for Grades one and two, such as Hoffman's exercises, nipple shields, and the inverted syringe technique, whereas Grade three usually requires surgical correction (**Chowdhry et al., 2024**).

Hoffman's exercise is a non-surgical intervention designed to manage flat and inverted nipples and support successful breastfeeding. The technique was developed by Dr. J. Brooks Hoffman in 1953 as a manual technique to release adhesions that keep the nipples flat, inverted, or short. The exercise helps the nipple protrude and prepares nipples for breastfeeding (**Alifah et al., 2023**).

Nurses play a crucial role during the prenatal and postnatal periods by providing evidence-based education and practical support to mothers and families. Responsibilities include preparing mothers for breastfeeding, explaining normal infant behaviors, and addressing challenges such as poor latching by teaching effective management techniques. Nurses also teach and reinforce Hoffman's exercise to improve nipple elasticity, ensure proper positioning during early breastfeeding and create a supportive environment that prevents unnecessary introduction of commercial milk formula, thereby promoting

successful and sustained breastfeeding (Pérez-Escamilla et al., 2023).

### **Significance of the study**

Breastfeeding is a natural and essential practice that provides optimal nutrition and immune protection for infants. Lack of exclusive breastfeeding in the first six months is linked to 1.4 million child deaths and 10% of diseases in children under five years of age, highlighting the importance of exclusive breastfeeding in improving child health outcomes (George et al., 2024; WHO, 2023).

Globally, 48% of babies under six months are exclusively breastfed, to reach 50% by 2025 and 70% by 2030. In Egypt, 58% of babies under two months are exclusively breastfed, but this drops to 45% by four to five months and 40% by six months (WHO & UNICEF, 2024; CAPMAS et al., 2022).

Flat and inverted nipples often cause poor infant latching, which leads to insufficient milk intake, maternal frustration, and reduced infant satisfaction, which may result in early BF cessation. This can limit the child's access to important health benefits, including better growth, a lower risk of infections and chronic diseases, and improved cognitive development (Nabulsi et al., 2022).

Several surgical techniques have been described for correcting flat and inverted nipples. Some of these are expensive and may be associated with side effects such as impaired lactation (Lodhi et al., 2025).

Among non-pharmacological interventions, Hoffman's exercise is a simple, safe, and cost-effective manual technique employed to correct flat or inverted nipples. The technique works by breaking adhesions at the nipple base, releasing fibrous bands, and improving tissue elasticity, thereby gradually promoting nipple eversion and enhancing readiness for breastfeeding (Rakhimol & Jose, 2024).

Therefore, considering the safety, effectiveness, and cost-efficiency of Hoffman's exercise, as well as the researcher's interest in shifting from traditional nipple correction methods to proactive manual techniques that support breastfeeding, the current research was done to evaluate the influence of Hoffman's exercise on breastfeeding level among primiparous women with flat and inverted nipples.

### **Aim of the study**

The study aimed to evaluate the effect of Hoffman's exercise on breastfeeding level among primiparous women with flat and inverted nipples.

### **Research Hypotheses**

**H1** Primiparous women with flat and inverted nipples who practiced Hoffman's exercise during pregnancy, immediately after delivery, and until the end of puerperium would exhibit higher levels of breastfeeding than those who did not practice it.

**H2** Primiparous women with flat and inverted nipples who practiced Hoffman's exercise during pregnancy, immediately after delivery, and until the end of puerperium would have higher satisfaction with breastfeeding than those who did not practice it.

## **2. Subjects and Method**

### **2.1. Research design**

A Quasi-experimental research design (study & control groups) was employed to achieve the aim of this study .

### **2.2. Research setting**

The research was done at the Obstetrics and Gynecology Outpatient Clinics of Benha University Hospital.

### **2.3. Sampling**

**Sample type** A purposive sample was employed to fulfill the aim of the study.

**Sample size** A number of 76 primiparous women were recruited for the present study.

The research population comprised primiparous women in the last trimester of pregnancy who had flat or inverted nipples and attended the research setting over a six-month period, from the beginning of May 2025 to the end of October 2025.

The sample was selected based on the following inclusion criteria: primiparous women with a gestational age of 37 weeks or more; presence of at least one inverted nipple (Grade one or two) or flat nipples; singleton pregnancy; intention to practice exclusive breastfeeding; no history of surgical procedures involving the nipple or areola; and absence of maternal medical conditions that could interfere with breastfeeding.

#### **Sample technique**

The total sample (n = 76) was recruited and equally allocated into two groups. The control group (n = 38), who received routine breastfeeding care only, was recruited first. Then, the study group (n = 38) received Hoffman's exercise in addition to routine breastfeeding care. This sequential recruitment was applied to prevent information contamination between the two groups.

### **2.4. Tools of data collection**

Four tools were utilized for data collection in the present study:

**2.4.1. Tool I Structured Interviewing Questionnaire** was developed by the researcher after reviewing the relevant literature.

(Raut et al., 2025; Belal et al., 2024; Sriningsih et al., 2023; Rakhimol & Jose, 2024). The tool was prepared in the Arabic language and consisted of closed-ended questions. The questionnaire comprised two parts:

- **Part I** General characteristics of the investigated sample, including age,

residence, educational level, family type, occupation and family income.

- **Part II** Obstetric history of the studied sample, including gestational age and antenatal follow-up during pregnancy.

#### **2.4.2. Tool II Nipple Type and Inversion Grade Assessment Tool**

This tool was developed by the researcher based on an extensive review of the literature

(Waller, 1946; Alexander et al., 1992; Lowdermilk et al., 2023) to assess nipple type, as nipples were classified into normal (protruded), flat and inverted. In cases of inversion the grades were determined using the manual pinch test as follows:

Grade one (easily pulled out and maintains projection).

Grade two (can be pulled out but retracts after release).

Grade three (severely inverted and cannot be pulled out).

#### **2.4.3. Tool III LATCH Scale**

The LATCH scale was developed by (Jensen et al., 1994) and adopted by the researcher to assess breastfeeding level. The scale consisted of five components: latch of the newborn onto the breast, audible swallowing, type of nipple, maternal comfort, and the amount of assistance required to position the newborn at the breast. The total score was ranged from zero to ten and is interpreted as follows:

- Poor breastfeeding level: zero to three
- Fair breastfeeding level: four to six.
- Good breastfeeding level: seven to ten.

#### **2.4.4. Tool IV Maternal Breastfeeding Evaluation Scale (MBFES-A).**

The Arabic version of the MBFES was developed by (Nabulsi et al., 2021) and adopted by the researcher to assess maternal satisfaction with breastfeeding experience. This self-reported scale consists of 26 items distributed across three subscales: Maternal Enjoyment/Role Attainment, Infant Satisfaction/Growth, maternal satisfaction with breastfeeding experience. This self-reported scale consists of 26 items distributed across three subscales: Maternal Enjoyment/Role Attainment, Infant Satisfaction/Growth, and Lifestyle/Body Image. Each item is rated on a five-point Likert scale ranging from one (completely unsatisfied) to five (completely satisfied). The total score was ranged from 26 to 130 and is categorized as follows:

- Low satisfaction: 26 to <60
- Moderate satisfaction: 60 to <95
- High satisfaction: 95–130

#### **Tools validity and Reliability**

The data collection tools were reviewed by a panel of three experts in obstetrics and gynecology nursing at Benha University to ensure content validity. Modifications were made based on the experts' feedback, including adding, rephrasing, omitting, and clarifying certain items. Reliability was assessed statistically prior to data collection via Cronbach's alpha coefficient. The reliability coefficient was 0.804 for the LATCH scale (Tool III) and 0.990 for the Arabic MBFES (Tool IV), indicating high internal consistency.

#### **Ethical considerations**

Ethical approval was obtained from the Scientific Research Ethics Committee of the Faculty of Nursing, Benha University (Code: REC-OBSN P 133). Official permission to conduct the research was also obtained from the Dean of the Faculty of Nursing and the Director of the Obstetrics

and Gynecology outpatient clinics. The purpose of the research was explained to each participant prior to data collection to establish trust and cooperation. Informed oral consent was obtained from all participating women. The acquired data was kept confidential and anonymous, and participants were notified that they could withdraw from the study at any moment without penalty. At the end of the study, women in the control group were provided with an instructional brochure for future reference.

#### **Preparatory phase**

During the preparatory phase, data collection tools were developed following an extensive review of the current local and international literature on various aspects of the study. This review included books, scientific articles, periodicals, and internet resources, which enabled the researcher to gain comprehensive knowledge regarding the scope and significance of Hoffman's exercise technique and guided the preparation of the required data collection tools. In addition, the researcher received practical training on the Pinch Test technique to ensure accurate and consistent assessment of nipple types and degrees of inversion.

#### **Pilot study**

The pilot research was done on 10% of the total research period over approximately three weeks and included eight primiparous women. No changes were required following the pilot study. The pilot study was implemented before data collection to determine the time required to complete each tool, evaluate the clarity, simplicity, applicability, and feasibility of the developed instruments, and identify potential challenges that could interfere with data collection. Participants included

in the pilot study were included in the main study sample.

## **2.5. Field work**

Recruitment was conducted from May to October 2025. Follow-up assessment was conducted six weeks postpartum for each participant and the total duration of data collection extended until December 2025. The researcher attended the previously identified setting three days per week (Sundays, Tuesdays, and Thursdays) from 9:00 a.m. to 12:00 p.m. Data were collected from primiparous women attending the setting who fulfilled the predetermined inclusion criteria. The research was implemented through the following phases:

### **A-Interviewing and Assessment phase**

This phase involved conducting interviews with women to obtain baseline data at obstetrics and gynecology outpatient clinics. Interviews were done in a designated private area to ensure confidentiality and privacy. At the beginning of each interview, the researcher introduced herself to each pregnant woman, provided a brief explanation of the research objectives to gain cooperation, arranged session schedules and frequencies to ensure adherence to the intervention plan in accordance with antenatal visit schedules, and obtained informed oral consent for participation.

The researcher administered a structured interview questionnaire (Tool I) to collect personal and obstetric data through face-to-face interviews done during the third trimester of pregnancy. Completion of the questionnaire required approximately five to ten minutes, depending on the participants' responses. Participants were assured that all collected information would remain confidential and would be employed exclusively for research purposes. The

number of women interviewed ranged from two to four per week.

The researcher employed the Nipple Type and Inversion Grade Assessment (Tool II) to assess the women's breasts and determine the nipple type and, if present, the degree of inversion. The assessment was done by the researcher via both physical examination and the manual pinch test.

During the physical examination, the nipple was visually inspected for shape, symmetry, and any signs of flatness or inversion. This was followed by the pinch test, in which the thumb and forefinger were placed on the areola and gently pressed inward. A normal nipple would evert or become erect, whereas an inverted nipple would retract inward.

Nipples were categorized as everted, flat, or inverted. Flat nipples were defined as nipples positioned at the same level as the areola, showing neither protrusion nor indentation and lacking spontaneous eversion. Inverted nipples were identified as nipples located below the areolar level with a crater-like appearance. Inverted nipples were further classified into three grades based on the Han and Hong classification system. Women diagnosed with Grade three inverted nipples were excluded from participation in the study.

### **B-Planning phase**

Based on the baseline data and literature review, various teaching methods and materials were prepared, including videos, demonstrations, re-demonstrations, group discussions, role-playing, and an Arabic brochure. The brochure contained information about breastfeeding, flat and inverted nipples, and Hoffman's exercise technique. The brochure explained the meaning, importance, and steps of

Hoffman's exercise and was supported with photos for better understanding .

The number of educational sessions and content were established. The overarching objective was that, by the conclusion of the educational sessions, each participant would possess adequate knowledge regarding flat and inverted nipples and demonstrate the ability to correctly perform Hoffman's exercise technique to promote effective breastfeeding.

The educational content was delivered in two sessions done individually or in small groups of one to two pregnant women. Each session lasted approximately 45–60 min, with time allocated for discussion and clarification. The telephone numbers of participants were obtained to facilitate contact in cases where women didn't attend next scheduled visit.

### **C-Implementation phase**

#### *For the study group*

Participants in the study group attended two structured educational sessions:

- **First session** This session focused on providing women's knowledge regarding flat and inverted nipples.
- **Second session** This session aimed to educate women on the management of inverted nipples through the application of Hoffman's exercise technique.

The researcher instructed participants on the proper execution of Hoffman's exercise. Women were advised to sit comfortably and place both thumbs opposite each other at the base of the nipple. The thumbs were then gently but firmly pulled apart in both horizontal and vertical directions while applying pressure to the breast. Subsequently, the thumbs were rotated around the base of the nipple to facilitate

tissue stretching and promote gradual nipple eversion.

Women were advised to perform Hoffman's exercise five times daily in both horizontal and the vertical direction for approximately five minutes

Women were instructed to start Hoffman's exercise at 37 weeks of pregnancy until six weeks postpartum. Various teaching methods were used, questions were answered and feedback was reinforced.

Women received brochures with session content and weekly reminders via phone or messages. The researcher-maintained contact through phone and video calls to ensure the correct application of the technique and provided advice as needed. Participants were encouraged to call the researcher at any time for further discussion or clarification.

#### *For the control group*

Participants in the control group received routine antenatal care (ANC). participants were also provided with general health education related to breastfeeding techniques, positions, and benefits as a part of the standard care.

Follow-up phone calls were done to minimize dropout rates and to provide necessary guidance, excluding any instruction related to Hoffman's exercise technique.

### **D-Evaluation phase**

For both groups, the researcher evaluates women's breastfeeding levels two times after delivery using the same format of Tool III at one week and six weeks after delivery (end of puerperium). Additionally, Tool IV was used to evaluate maternal satisfaction with the breastfeeding experience in both groups at six weeks after delivery.

### Statistical analysis

The collected data were systematically organized, coded, tabulated, and analyzed using the Statistical Package for the Social Sciences (SPSS), version 25. Descriptive statistical measures, including frequencies, percentages, means, and standard deviations, were applied. Inferential statistical tests were performed, with qualitative variables analyzed via the Chi-square test. For non-parametric data, the Wilcoxon test was employed to compare outcomes across two time points within the same group, while the Mann–Whitney U test was utilized to compare differences between two independent groups. Correlations among research variables were examined via the Spearman correlation coefficient (R). The internal consistency reliability of the research tools was assessed via Cronbach's alpha.

- Differences were considered statistically insignificant when  $p > 0.05$ .
- Differences were considered statistically significant when  $p \leq 0.05$ .
- Differences were considered highly statistically significant when  $p \leq 0.001$ .

### 3. Results

The general characteristics of the participants showed about 76.3% and 68.4% of the study and control groups were in the age group 20–<25 years, with a mean age of  $23.18 \pm 3.11$  years and  $24.05 \pm 3.48$  years, respectively. Additionally, 68.4% and 63.2% of the study and control groups lived in rural areas, 52.6% and 60.5% attained secondary education, 81.6% and 76.3% were housewives, 65.8% belonged to extended families, and 47.4% and 50% reported insufficient monthly income (Table 1).

The breastfeeding level at the first and six weeks postpartum, the study group showed higher scores than the control group across all subscales, with total breastfeeding scores increasing from  $5.39 \pm 1.85$  to  $7.42 \pm 2.26$  in the study group compared to  $3.16 \pm 2.16$  to  $4.66 \pm 2.13$  in the control group ( $P \leq 0.01$ ) (Table 2).

The proportion of women with a good level of breastfeeding at the first and six weeks postpartum, showed 23.7% and 68.4% in the study group compared to 7.9% and 21.1% in the control group, respectively (Fig. 1).

The maternal breastfeeding domains, including infant satisfaction and growth, maternal enjoyment and role attainment, and lifestyle and body image, showed higher mean total scores in the study group ( $100.84 \pm 30.2$ ) compared to the control group ( $79.68 \pm 25.65$ ), with a statistically significant difference ( $P \leq 0.01$ ) (Table 4)

Maternal satisfaction at the six-week postpartum showed 71.1% of the study group with a high level of satisfaction compared to 23.7% of the control group (Fig. 2).

A highly statistically significant positive correlation between total breastfeeding level and total maternal breastfeeding evaluation score at the six-week postpartum ( $P < 0.01$ ) (Table 4).

Regarding general characteristics, education level, occupation, family type, and monthly income showed statistically significant associations with breastfeeding level and maternal satisfaction ( $P < 0.05$ ), while age and residence showed no significant association.

Table 1 Distribution of women in the study and control groups according to general characteristics (n=76).

General Characteristics	Study group (n=38)		Control group (n=38)		Chi-square	
	No.	%	No.	%	X <sup>2</sup>	P-Value
<b>Age (years)</b>					0.719	0.698
20-<25	29	76.3	26	68.4		
25-<30	8	21.1	10	26.3		
30-<35	1	2.6	2	5.3		
<b>Median (IQR)</b>	22 (25.0-24.25)		23 (21.0-26.25)		Z=1.22	P=0.222
<b>Mean ± S.D</b>	23.18 ± 3.11		24.05 ± 3.48			
<b>Residence</b>					0.234	0.629
Rural	26	68.4	24	63.2		
Urban	12	31.6	14	36.8		
<b>Education level</b>					1.257	0.739
Read and write	3	7.9	1	2.6		
Primary education	4	10.5	4	10.5		
Secondary education	20	52.6	23	60.5		
University education	11	28.9	10	26.3		
<b>Occupation</b>					0.317	0.574
Housewife	31	81.6	29	76.3		
Working	7	18.4	9	23.7		
<b>Type of family</b>					0.000	1.000
Nuclear	13	34.2	13	34.2		
Extended	25	65.8	25	65.8		
<b>Monthly income</b>					0.873	0.646
Not enough	18	47.4	19	50.0		
To some extent	12	31.6	14	36.8		
Enough	8	21.1	5	13.2		

Z: Mann-Whitney test. No Statistically significant at  $p > 0.05$ . "Mean ± SD presented for descriptive purposes only; statistical comparisons based on median (IQR) using Mann-Whitney U test "

Table 2 Comparison between the study and control groups regarding the level of breastfeeding at the first and six weeks postpartum (n=76).

Level of Breastfeeding		1 <sup>st</sup> week				6 <sup>th</sup> week				(p <sub>1</sub> )	(p <sub>2</sub> )
		Study group		Control group		Study group		Control group			
		No.	%	No.	%	No.	%	No.	%		
Latch	Good	14	36.8	5	13.2	25	65.8	5	13.2	X <sup>2</sup> =8.46 P=0.015*	X <sup>2</sup> =22.405 P=0.000**
	Fair	17	44.7	16	42.1	10	26.3	22	57.9		
	Poor	7	18.4	17	44.7	3	7.9	11	28.9		
Audible swallowing	Good	6	15.8	2	5.3	18	47.4	4	10.5	X <sup>2</sup> =7.68 P=0.022*	X <sup>2</sup> =12.81 P=0.002**
	Fair	24	63.2	17	44.7	16	42.1	25	65.8		
	Poor	8	21.1	19	50.0	4	10.5	9	23.7		
Type of nipples	Good	10	26.3	2	5.3	21	55.3	7	18.4	X <sup>2</sup> =7.32 P=0.026*	X <sup>2</sup> =11.33 P=0.003**
	Fair	19	50.0	20	52.6	12	31.6	24	63.2		
	Poor	9	23.7	16	42.1	5	13.2	7	18.4		
Comfort – Breast Nipple	Good	11	28.9	5	13.2	25	65.8	6	15.8	X <sup>2</sup> =9.23 P=0.010**	X <sup>2</sup> =20.07 P=0.000**
	Fair	23	60.5	18	47.4	11	28.9	24	63.2		
	Poor	4	10.5	15	39.5	2	5.3	8	21.1		
Hold – Positioning	Good	8	21.1	3	7.9	21	55.3	6	15.8	X <sup>2</sup> =11.89 P=0.003**	X <sup>2</sup> =13.07 P=0.001**
	Fair	24	63.2	15	39.5	13	34.2	26	68.4		
	Poor	6	15.8	20	52.6	4	10.5	6	15.8		
Total level of breast feeding									X <sup>2</sup> =11.78 P=0.003**	X <sup>2</sup> =17.47 P=0.000**	
Median (IQR)	5 (4.0-6.25)		2.5(1.0-5.0)		8 (5.0-9.0)		5(2.75-6.0)		Z <sup>1</sup> =4.21	Z <sup>1</sup> =4.62	
Mean ± SD	5.39 ± 1.85		3.16 ± 2.16		7.42 ± 2.26		4.66 ± 2.13		P=0.000**	P=0.000**	

X<sup>2</sup>: Chi-square test. Z<sup>1</sup>: Mann-Whitney test. IQR: Interquartile Range. SD: Standard deviation. P: p-value

P1: P for comparing between the (Research and Control group) at the 1st week.

P2: P for comparing between the Research and Control group at the 6th week.

Fig.1 Percentage distribution of the study and control groups according to level of breastfeeding at the first week and six weeks postpartum.

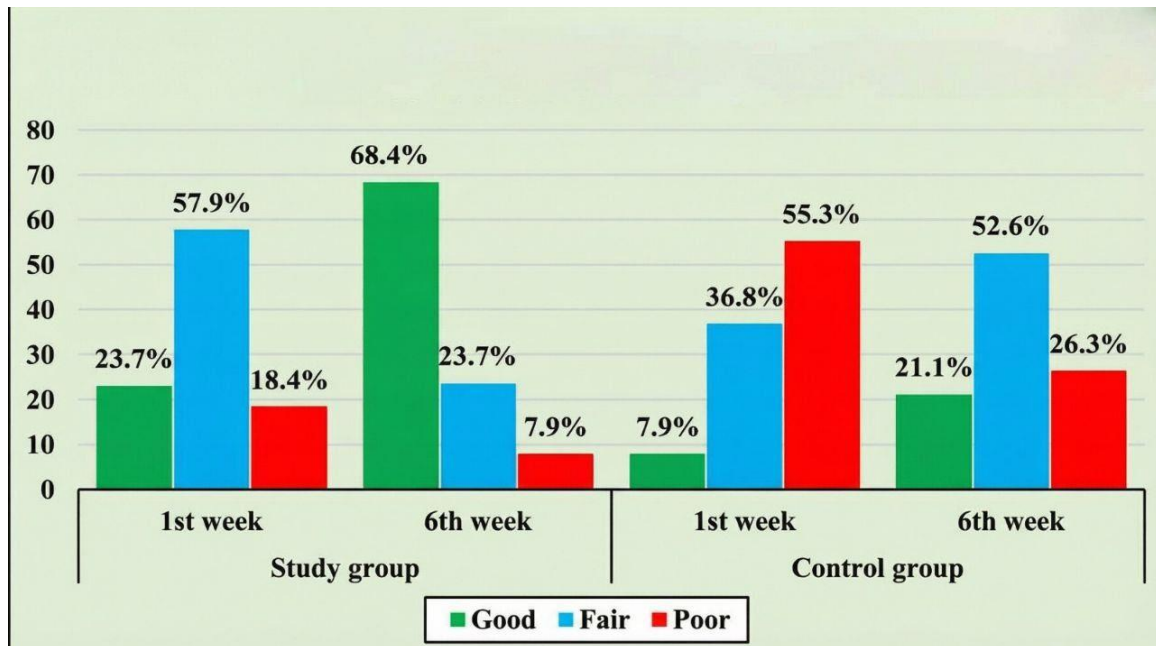


Table 3 Comparison between the study and control groups regarding total maternal breastfeeding evaluation score at the six-week postpartum.

Items	Study group (n=38)		Control group (n=38)		X <sup>2</sup>	P-value	
	No.	%	No.	%			
Infant satisfaction and growth	High	23	60.5	9	23.7	10.696	0.005**
	Moderate	9	23.7	19	50.0		
	Low	6	15.8	10	26.3		
Maternal enjoyment and role attainment	High	24	63.2	8	21.1	14.14	0.001**
	Moderate	8	21.1	20	52.6		
	Low	6	15.8	10	26.3		
Lifestyle and body image.	High	26	68.4	8	21.1	17.61	0.000**
	Moderate	8	21.1	23	60.5		
	Low	4	10.5	7	18.4		
Total maternal breastfeeding score					17.33	0.000**	
Median (IQR)	112.0(77.5-126.25)		85.0(66.75-94.5)		Z=3.56	0.000**	
Mean ± SD	100.84 ± 30.2		79.68 ± 25.65				

X<sup>2</sup>: Chi-square test. Z: Mann-Whitney test. IQR: Interquartile Range. SD: Standard deviation. P: p-value Mean ± SD presented for descriptive purposes only; statistical comparisons based on median (IQR) via the Mann-Whitney U test.

Fig. 2 Percentage distribution of the study and control groups regarding total degree of satisfaction at the six-week postpartum.

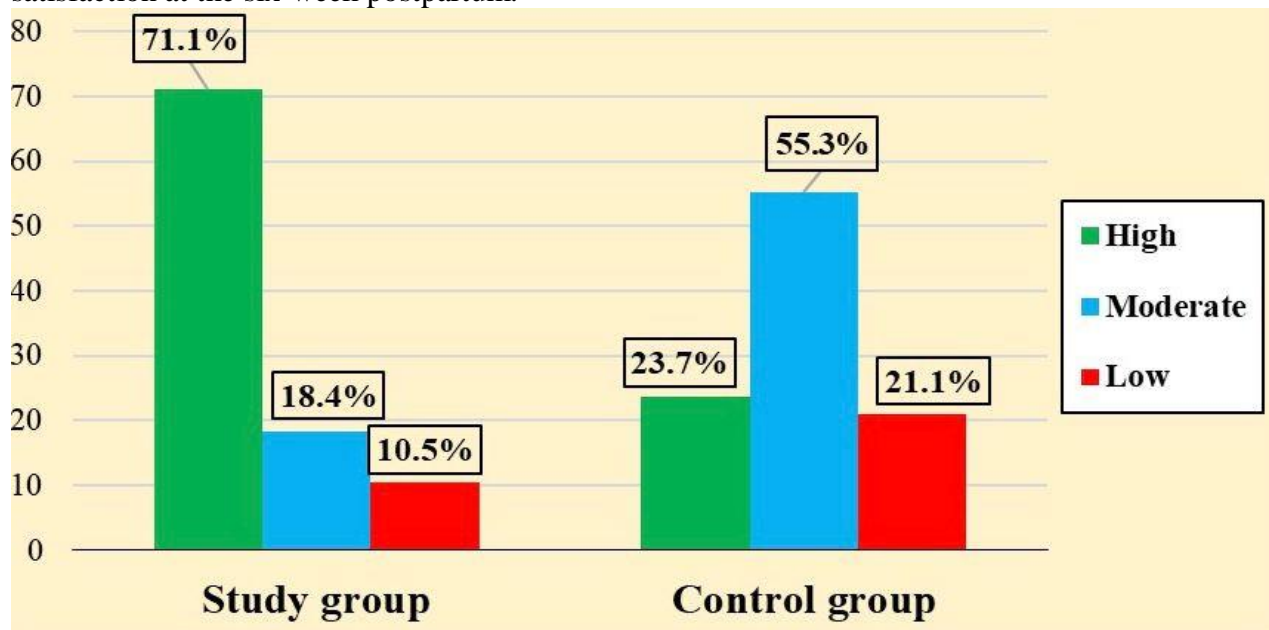


Table 4 Correlation between total breastfeeding level and total maternal breastfeeding evaluation score at the six-week postpartum between the studied women.

Variables	Total Maternal Breastfeeding Evaluation score			
	Study group (n=38)		Control group (n=38)	
	(R)	(P- value)	(R)	(P-value)
Total breastfeeding score	0.840	0.000**	0.866	0.000**

R= spearman correlation coefficient test. \*\*Highly significant Correlation at  $p < 0.01$ .

#### 4. Discussion

Mothers with flat or inverted nipples often face breastfeeding challenges because improper latch hinders early initiation of breastfeeding and results in inadequate milk transfer, infant dissatisfaction, increased maternal frustration and possible early cessation of breastfeeding (Sriningsih et al., 2023). Hoffman's exercise is a non-invasive, low-cost, and evidence-based practice method that effectively manages flat or inverted nipples. The technique improves nipple protrusion, facilitates proper latch, and enhances breastfeeding outcomes (Özhüner et al., 2022).

The present research was conducted to evaluate the effect of Hoffman's exercise on breastfeeding levels among primiparous women with flat and inverted nipples. Regarding the general characteristics of the studied primiparous women, the findings revealed that the control and study groups exhibited comparability in age, place of residence, educational level, occupation, family type and monthly income.

These findings were consistent with previously reported results indicating that control and study groups were comparable in terms of basic

demographic and general characteristics, reflecting homogeneity at the beginning of the study, which aligns with previous research observing similar characteristics between intervention and control groups ( $p > 0.05$ ) (Ahmed et al., 2024; Fang et al., 2021; Chowdhry et al., 2024).

Regarding age, the majority of women in both study and control groups were in the age group 20- < 25 years old, with a mean age of  $23.18 \pm 3.11$  years and  $24.05 \pm 3.48$  years, respectively. The findings of the current research may be explained by the good cooperation of the studied women, as younger women exhibited greater interaction with the researcher, and they had a greater ability to acquire more information.

This result was in agreement with previous research reporting a mean age of  $24.20 \pm 4.40$  years of the investigated groups (Çerçer, 2023). This finding also aligned with studies on the effect of Hoffman's exercise on inverted nipples among primipara mothers in Saudi Arabia, which reported that the highest percentage of primiparous women was 76.6% in the experimental group and 56.6% in the control group aged 21–25 years (Paulsamy et al., 2021).

Concerning the level of education, the result of the current study showed that nearly half of the study group and more than half of the control group had attained secondary education. This finding was consistent with previous research in Egypt showing that more than half of the participants were educated up to secondary level (Belal et al., 2024).

As regards residence, about two thirds of the study and control groups lived in rural areas. These results were in accordance with previous studies showing that most

of the examined women were from rural areas (Laksono et al., 2021; Rakhimol & Jose, 2024).

Regarding occupation, results of the current study showed that the majority of women in both the control and study groups were housewives. This finding was consistent with previous research in Egypt reporting that the majority of studied women were housewives (Ahmed et al., 2024)

Concerning family type, results of the current study showed that about two thirds of women in both the control and study groups belonged to extended families. Similarly, previous research in Egypt found that three quarters of participants (75%) belonged to joint families (Taj et al., 2025).

Regarding monthly income, the result of the current study showed that approximately half of the participants in each group reported insufficient monthly income. This finding aligned with previous research in Egypt and found that more than half of the control and study groups (60% and 56.4%, respectively) had insufficient monthly income (Abd-Ella & Mohammed, 2021).

Regarding total breastfeeding levels, the study group had higher mean scores compared to the control group at both the first and the six-week postpartum. At the first week, the mean total breastfeeding scores were  $5.39 \pm 1.85$  for the study group compared to  $3.16 \pm 2.16$  in the control group, with about one-quarter of mothers in the study group achieving a good breastfeeding level compared to less than one-tenth in the control group. By the sixth week, the study group's mean score increased to  $7.42 \pm 2.26$ , with more than two-thirds of mothers reaching a

good breastfeeding level, whereas the control group exhibited a smaller increase to  $4.66 \pm 2.13$ , with only slightly more than one-fifth achieving a good level.

Within the study group, a clear improvement was observed over time, with the mean total breastfeeding score rising from  $5.39 \pm 1.85$  at the first week to  $7.42 \pm 2.26$  at the sixth week, and the proportion of mothers with a good breastfeeding level increasing from about one-quarter to more than two-thirds.

These results were in accordance with previous research reporting a highly significant improvement in LATCH scores among both the Hoffman and syringe groups. All LATCH components exhibited significant improvement by the end of the first postpartum week, with continued progress throughout the postpartum period. In the Hoffman group, the proportion of mothers with good LATCH scores increased from less than one-fifth before the intervention to about two-thirds by the end of the first week, reaching the majority by the end of the postpartum period (**Belal et al., 2024**).

These results of the current study were in agreement with previous findings showing that the majority of women achieved high level of breastfeeding, with the total mean level of breastfeeding significantly improved to  $7.58 \pm 2.01$  as opposed to control group  $2.68 \pm 1.69$ , with highly statistically significant differences among the studied groups ( $p < 0.001$ ) in favor of the study group (**Elkhatib et al., 2024**).

These results of the current study regarding level of breastfeeding were consistent with previous studies reporting that more than half of the women in the intervention group achieved good level of

breastfeeding compared to less than one tenth of the control group, with highly statistically significant differences between both groups regarding the LATCH breastfeeding scores categories (**Abd-Ella & Mohammed, 2021**).

These results of the current study regarding level of breastfeeding were consistent with previous research indicating that after six weeks of intervention, breastfeeding level was adequate in two-thirds of the Hoffman's exercise group as opposed to less than half in the inverted syringe group. The overall mean breastfeeding level was  $7.40 \pm 3.09$  in the Hoffman's exercise group compared to  $5.32 \pm 3.72$  in the inverted syringe group, with statistically significant differences (**Ahmed et al., 2024**). Additionally, previous studies reported that Hoffman's exercise was highly effective in improving breastfeeding levels, correcting flat or inverted nipples, and supporting the initiation and maintenance of early breastfeeding among primipara mothers (**Paulsamy et al., 2021**). These findings were also supported by research demonstrating that the mean LATCH score increased from  $7.73 \pm 1.81$  before the intervention to  $8.66 \pm 1.61$  at 24 hours and  $9.95 \pm 0.30$  at one month postpartum, reflecting a highly statistically significant improvement in the mean LATCH scores of the study group during follow-up ( $P < 0.001$ ) (**Çetindemir & Cangöl, 2024**).

These results of the current study regarding level of breastfeeding disagreed with previous research reporting comparable improvement in breastfeeding rates at six weeks postpartum among women performing Hoffman's exercises as opposed to those who did not (**Hediger & Koenig, 2020**).

*From the researcher's perspective,* Hoffman's exercise improved the overall breastfeeding level among primiparous women with flat and inverted nipples over time. This may be related to improvements in nipple elasticity and facilitation of effective latching. Accordingly, the technique could contribute to better breastfeeding outcomes and potentially reduce early feeding difficulties.

These results support the research Hypothesis I, which stated that primiparous women with flat and inverted nipples who practiced the Hoffman's exercise would exhibit higher levels of breastfeeding than those who did not practice it.

Concerning the Maternal breastfeeding Evaluation Score at six weeks postpartum following the application of Hoffman's exercise technique, the results of the current research demonstrated that the mean total score of the MBFES was higher in the study group  $100.84 \pm 30.2$  compared to  $79.68 \pm 25.65$  in the control group, with a highly statistically significant difference between both groups. In addition, the majority of mothers in the study group showed high levels of satisfaction, whereas less than one-quarter of the control group were highly satisfied. Approximately one-quarter of the study group and more than half of the control group stated moderate satisfaction, while low satisfaction was observed in a smaller proportion of the study group compared with the control group.

Comparable findings were reported in previous research indicating that nearly half and more than one quarter of women in the study group were either very satisfied or satisfied, respectively, compared to only a small proportion and less than one tenth of women in the control group after Hoffman's

exercise, with a highly statistically significant difference between both groups (**Elkhatib et al., 2024**). Similarly, other research showed that more than one third and more than one quarter of participants in the intervention group were either strongly satisfied or satisfied, respectively, compared to only a small proportion of the control group after the intervention, with a highly statistically significant difference between both groups (**Abd-Ella & Mohammed, 2021**).

Additionally, previous research that assessed maternal satisfaction at six weeks postpartum using the MBFES and found that more than half of participants stated high satisfaction, one-quarter were satisfied and one-sixth had low satisfaction, which confirms that maternal satisfaction is an important factor in breastfeeding success (**Murugesan & Tripathy, 2022**).

These results of the current study regarding maternal satisfaction were consistent with research demonstrating higher maternal satisfaction at one month postpartum was associated with a longer duration of exclusive breastfeeding and a lower risk of early breastfeeding interruption, highlighting maternal satisfaction as an important predictor of breastfeeding success (**Bizon et al., 2023**). Similarly, another study demonstrated a significant improvement in maternal satisfaction between pre-test and post-test assessments ( $P < 0.001$ ), indicating that supportive interventions can positively influence maternal satisfaction with breastfeeding (**Ningsih et al., 2025**).

*From the researcher's point of view,* this improvement could be attributed to Hoffman's exercise enhancing latch and infant positioning while significantly increasing maternal satisfaction, including infant satisfaction and growth, maternal

enjoyment and role attainment, and lifestyle and body image. These results indicate that the exercise supports both successful breastfeeding and maternal psychological well-being, which boosts mothers' confidence and overall satisfaction with the breastfeeding experience.

These results support the study's hypothesis (II) which stated that "Primiparous women with flat and inverted nipples who practiced Hoffman's exercise would have higher satisfaction with breastfeeding than those who did not practice it".

Concerning relations between studied variables, breastfeeding level and maternal satisfaction in the study group were significantly associated with maternal education and family type, while occupation and monthly income were only significant at the first postpartum week. On the other hand, breastfeeding level and maternal satisfaction in the control group were significantly associated with education, occupation, family type and monthly income at either the first- or sixth-week postpartum. Age and residence exhibited comparable associations in both groups.

These results were consistent with previous research showing that higher maternal education levels significantly increased the likelihood of exclusive breastfeeding (**Laksono et al., 2021**). And were similar to previous finding indicating that exclusive breastfeeding had a significant relation with maternal employment and socioeconomic state (**Elbehisy et al., 2022**). Additionally, these results were nearly similar to previous research reporting that type of family, maternal education and socioeconomic status were significant determinants of good

breastfeeding practices ( $P < 0.05$ ) (**Srivastava et al., 2024**).

The current results regarding relation between variables disagreed with previous research which reported no significant association between the level of successful breastfeeding in Hoffman's exercise and sociodemographic variables such as education, occupation, and family income among primiparous women (**RAUT et al., 2025**).

The current study's findings on the correlation coefficient between total breastfeeding level and total satisfaction at the sixth week postpartum between the control and study groups revealed a highly statistically significant positive correlation ( $R = 0.840$  for the study group and  $R = 0.866$  for the control group,  $P < 0.01$ ) between the total score of breastfeeding level and the total MBFES score.

These results were consistent with previous research demonstrating that mothers who implemented exclusive breastfeeding were substantially more satisfied with their overall and subscale scores than mothers who partially breastfed or did not breastfeed, highlighting the association between successful breastfeeding and maternal satisfaction (**Nabulsi et al., 2021**). These observations regarding correlation coefficient between total breastfeeding level and total satisfaction were in agreement with previous research showing a positive correlation between breastfeeding self-efficacy and maternal satisfaction among primiparous mothers ( $P < 0.001$ ), which indicates that higher maternal confidence and competence in breastfeeding are associated with greater breastfeeding satisfaction (**Vaithilingan et al., 2023**).

These results of the current study regarding correlation coefficient between total breastfeeding level and total satisfaction were consistent with research which report that higher maternal satisfaction, as measured by the MBFES, exhibited positive associations with breastfeeding rates (Escribano et al., 2024).

*From a researcher's perspective*, more effective breastfeeding results in higher maternal satisfaction which indicates that interventions designed to improve breastfeeding as Hoffman's exercise, may directly enhance the overall breastfeeding experience.

### **5. Conclusions**

Flat and inverted nipples are common conditions that may negatively affect breastfeeding effectiveness and maternal satisfaction, highlighting the importance of effective interventions to support successful breastfeeding. Mothers in the study group demonstrated a marked improvement in overall breastfeeding performance and maternal satisfaction compared to those in the control group after the implementation of Hoffman's exercise. Furthermore, a highly statistically significant positive association was observed between overall breastfeeding level and maternal satisfaction in both study and control groups, confirming the fulfillment of the research objectives and supporting the stated research hypotheses.

These findings emphasize the effectiveness of Hoffman's exercise as a practical and non-invasive intervention for managing flat and inverted nipples, and suggest that its integration into routine antenatal and postnatal nursing care can enhance breastfeeding outcomes and maternal satisfaction. Adopting Hoffman's exercise as part of standard nursing practice is

recommended for mothers with flat or inverted nipples

Moreover, future research should be conducted across diverse clinical settings with larger sample sizes to strengthen the generalizability of these findings, and comparative studies are encouraged to examine the effectiveness of Hoffman's exercise relative to other nipple correction interventions in improving breastfeeding outcomes among mothers with inverted nipples.

### **Author Contributions**

E.S.M. designed the study, collected the study data, performed the statistical analysis, and drafted the manuscript. A. A. H. and R. S. A. supervised the research process, critically revised the manuscript, and approved the final version for publication. All authors read and approved the final manuscript.

**Funding** This work received no external funding.

**Acknowledgments.** The authors would like to thank all the women who participated in this study for their cooperation and valuable contribution. Thanks also to all reviewer for valuable comments that improved the manuscript.

**Conflicts of Interest** There is no conflict of interest in this work.

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