

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

## Abstract

**Background:** Flat and inverted nipples are common conditions that may negatively affect breastfeeding (BF) effectiveness and maternal satisfaction. Hoffman's exercise is a simple, non-invasive technique employed to improve nipple protrusion and enhance postpartum BF outcomes. **Aim:** To assess the effect of Hoffman's exercise on BF level among primiparous women with flat and inverted nipples. **Research design:** a Quasi-experimental research design. **Research setting:** The current research was done at the Obstetrics and Gynecology Outpatient Clinics at Benha University Hospital. **Research sample:** A purposive sample of 76 primiparous women was selected based on the inclusion criteria and allocated into two groups (38 women each). Tools for collecting data: Four tools were used: tool (I) a structured interview questionnaire with two sections (general characteristics and obstetric history); tool (II) Nipple Type and Inversion Grade Assessment Tool; tool (III) LATCH scale; and tool (IV) Maternal BF Evaluation Scale. **Results:** After implementing the approach, the study group's BF rates and mother satisfaction significantly improved compared to the control group ( $P < 0.001$ ). There was a substantial positive correlation between total BF level and total mother satisfaction when the approach was implemented ( $P < 0.001$ ). **Conclusion:** Hoffman's exercise improved BF levels and increased maternal satisfaction among mothers with flat or inverted nipples during the postpartum period. **Recommendation:** Integrating Hoffman's exercise into routine nursing care for mothers diagnosed with flat and inverted nipples.

**Keywords:** Breastfeeding outcomes, flat nipples, Hoffman's exercise, inverted nipples, primipara.

## 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 BF within the first hr after birth, exclusively BF for the first six months (without providing any other food or liquids, including water), and continuing BF alongside appropriate complementary feeding from six months up to two years of age or beyond (Jackson *et al.*, 2025). Exclusively BF 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, BF contributes to postpartum (PP) 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 BF 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 BF. Although the condition is not life-threatening, it 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 I, characterized by minimal fibrosis, in which the nipple can be easily everted and maintains its projection; Grade II, defined by moderate fibrosis, in which the nipple can be manually everted but does not sustain projection; and Grade III, marked by severe fibrosis, in which the nipple cannot be manually everted. Non-surgical methods are commonly employed 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 BF. It 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 it for BF (*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 BF, 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 the first BF, and create a supportive environment that prevents unnecessary introduction of commercial milk formula, thereby promoting successful and sustained BF (*Pérez-Escamilla et al., 2023*).

#### **Significance of research :**

BF is a natural and essential practice that provides optimal nutrition and immune

protection for infants. Lack of exclusive BF (EPF) 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 EPF 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 2 months are exclusively breastfed, but this drops to 45% by 4–5 months and 40% by 6 months (WHO and 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. It works by breaking adhesions at the nipple base, releasing fibrous bands, and improving tissue elasticity, thereby gradually promoting nipple eversion and enhancing readiness for BF (*Rakhimol and 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 BF, the current research was done to evaluate the influence of Hoffman's exercise on BF

performance in primiparous women with flat and inverted nipples.

#### **Aim of research :**

The research aimed to evaluate the influence of Hoffman's exercise on BF performance in 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 BF than those who didn't do 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 BF than those who did not do it.

#### **Subjects and Method:**

##### **Research design:**

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

##### **Research setting**

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

##### **Sampling:**

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

**Sample size:** A total of 76 primiparous women were recruited for the present study. The research population comprised all 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 (GA) of 37 weeks or more; presence of at least one inverted nipple (Grade I or II) or flat nipples; singleton pregnancy; intention to practice

EPF; no history of surgical procedures involving the nipple or areola; and absence of maternal medical conditions that could interfere with BF.

#### **Sample technique:**

The total sample was recruited and equally divided into two groups. The control group (n=38), who received routine BF care only, was included first, then the study group (n=38), who received Hoffman's exercise in addition to routine BF care, to avoid information contamination between the two groups.

#### **Tools of data collection:**

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

**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 and Jose,2024*) It 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 GA and antenatal follow-up during pregnancy.

#### **Tool II: Nipple Type and Inversion Grade Assessment**

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*) It was employed to assess nipple type and, in cases of nipple inversion, to determine the degree of inversion. The assessment was done by the researcher through physical examination and a manual pinch test.

#### **Tool III: LATCH Scale**

The LATCH scale, developed by *Jensen and colleagues (1994)*, was adopted by the

researcher to assess BF level. The scale consists 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 ranges from 0 to 10 and is interpreted as follows:

- Poor BF level: 0–3
- Fair BF level: 4–6
- Good breastfeeding level: 7–10

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

The Arabic version of the MBFES, developed by *Nabulsi et al. 2021*, was adopted to assess maternal satisfaction with the BF experience. This self-stated 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 5-point Likert scale ranging from 1 (completely unsatisfied) to 5 (completely satisfied). The total score ranges 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 gynecological 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 conclusion of the study, women in the control group received an instructive leaflet for future reference.

#### **Operational Design**

##### **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 sample over approximately 3 weeks and included 8 primiparous women. No changes were required following the pilot study. The pilot was implemented prior to the commencement of 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 research were retained in the main research sample.

##### **Field work:**

The research was done over a six-month period, from the beginning of May 2025 to the end of

October 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 all 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 outset 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 5–10 min, 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 2 to 4 per week.

The researcher employed the Nipple Type and Inversion Grade Assessment (Tool II) to assess the women's breasts and determine their 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 3 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 BF, 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 their content were established, and measurable objectives were formulated to be achieved upon completion of the program. 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 BF.

The educational content was delivered in two sessions (one theoretical and one practical), done individually or in small groups of 1–2 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 their next scheduled visit.

### **C-Implementation phase:**

#### *The study group:*

Participants in the study group attended two structured educational sessions:

- **First session (theoretical):** This session focused on enhancing women's knowledge regarding flat and inverted nipples.
- **Second session (practical):** 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 technique five times a day in the horizontal and the vertical plane for 5 min.

Women were instructed to start Hoffman's exercise at 37 weeks of pregnancy until 6 weeks PP. 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). They were also provided with general health education related to BF techniques,

positions, and benefits as a part of the standard care.

Participants in the control group received routine ANC, including general health education related to BF benefits, techniques, and positioning, as part of standard clinical practice. 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 the research and control groups, BF levels were assessed twice PP via Tool III at one week and six weeks following delivery. Additionally, maternal satisfaction with the BF experience was evaluated at six weeks PP, corresponding to the end of the puerperium, via Tool IV for both groups.

### **Statistical analysis:**

The collected data were systematically organized, coded, tabulated, and analyzed via 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  $p \leq 0.001$ .

### **Results:**

**Table 1** exhibits that 76.3% and 68.4% of the control and study groups were in the age group of 20 - < 25 years, with mean ages of

23.18 ± 3.11 years and 24.05 ± 3.48 years, respectively. 68.4% and 63.2% of the study and areas, respectively. 52% of the control groups were from rural areas. 6% and 60.5% of the study and control groups had secondary education, respectively. 81.6% and 76.3% of the study and control groups were housewives, respectively. 65.8% of the study and control groups belonged to extended families, respectively. 47.4% and 50.0% of the study and control groups stated that their monthly income was not enough, respectively.

**Table 2 exhibits that** the study group had higher total BF scores than the control group at both the 1st and 6th weeks PP. The total level of BF in the good category increased from 23.7% at the 1st week to 68.4% at the 6th week in the study group, as opposed to 7.9% to 21.1% in the control group. The mean total BF scores increased from 5.39 ± 1.85 to 7.42 ± 2.26 in the study group as opposed to 3.16 ± 2.16 to 4.66 ± 2.13 in the control group at the 1st and 6th weeks, respectively, with highly statistically significant differences (P ≤ 0.01).

**Table 3 exhibits that** the total level of BF in the good category increased from 23.7% at the 1st week to 68.4% at the 6th week PP within the study group. The mean of total BF score increased from 5.39 ± 1.85 to 7.42 ± 2.26, with a highly statistically significant difference (P<0.01).

**Figure 1 exhibits** 23.7% of the study group had a good level of BF as opposed to 7.9% of the control group, at the 1st week PP. However, the proportion of women with a good level of BF increased to 68.4% in the

study group as opposed to 21.1% in the control group by the 6th week PP.

**Table 4 exhibits** 71.1% of the study group had a high total satisfaction score as opposed to 23.7% of the control group at the 6th week postpartum. The mean total maternal BF scores in the study and control groups were 100.84 ± 30.2 points and 79.68 ± 25.65 points, respectively, with statistically significant differences between both groups (P ≤ 0.01).

**Figure 2 exhibits 71.1% of the study group had a high level of satisfaction with their BF experience at the 6th week PP,** as opposed to only 23.7% of the control group.

**Table 5 exhibits** a highly statistically significant positive correlation between total BF level and total maternal BF evaluation score at the 6th week PP in both the study and control groups (P<0.01).

Regarding general characteristics, education level, occupation, family type, and monthly income exhibited statistically significant associations with BF level and maternal satisfaction (P<0.05). At the same time, age and residence exhibited a comparable association.

**Table (1): Distribution of participants according to general characteristics (n=76).**

General characteristics	Study group (n=38)		Control group (n=38)	
	No.	%	No.	%
<b>Age (years)</b>				
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>Mean ± S. D</b>	23.18 ± 3.11		24.05 ± 3.48	
<b>Residence</b>				
<b>Rural</b>	26	68.4	24	63.2
<b>Urban</b>	12	31.6	14	36.8
<b>Education level</b>				
<b>Read and write</b>	3	7.9	1	2.6
<b>Primary education</b>	4	10.5	4	10.5
<b>Secondary education</b>	20	52.6	23	60.5
<b>University education</b>	11	28.9	10	26.3
<b>Occupation</b>				
<b>Housewife</b>	31	81.6	29	76.3
<b>Working</b>	7	18.4	9	23.7
<b>Type of family</b>				
<b>Nuclear</b>	13	34.2	13	34.2
<b>Extended</b>	25	65.8	25	65.8
<b>Monthly income</b>				
<b>Not enough</b>	18	47.4	19	50.0
<b>To some extent</b>	12	31.6	14	36.8
<b>Enough</b>	8	21.1	5	13.2

**Table (2): Comparison between the instigated groups regarding level of breastfeeding at the 1st and 6th weeks postpartum (n=76).**

Level of Breastfeeding		1 <sup>st</sup> week				6th weeks				(p <sub>1</sub> )	(p <sub>2</sub> )
		Study group		Control group		Study group		Control group			
		No.	%	No.	%	No.	%	No.	%		
<b>Latch</b>	<b>Good</b>	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**
	<b>Fair</b>	17	44.7	16	42.1	10	26.3	22	57.9		
	<b>Poor</b>	7	18.4	17	44.7	3	7.9	11	28.9		

<b>Audible swallowing</b>	<b>Good</b>	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**
	<b>Fair</b>	24	63.2	17	44.7	16	42.1	25	65.8		
	<b>Poor</b>	8	21.1	19	50.0	4	10.5	9	23.7		
<b>Type of nipples</b>	<b>Good</b>	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**
	<b>Fair</b>	19	50.0	20	52.6	12	31.6	24	63.2		
	<b>Poor</b>	9	23.7	16	42.1	5	13.2	7	18.4		
<b>Comfort – Breast Nipple</b>	<b>Good</b>	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**
	<b>Fair</b>	23	60.5	18	47.4	11	28.9	24	63.2		
	<b>Poor</b>	4	10.5	15	39.5	2	5.3	8	21.1		
<b>Hold – Positioning</b>	<b>Good</b>	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**
	<b>Fair</b>	24	63.2	15	39.5	13	34.2	26	68.4		
	<b>Poor</b>	6	15.8	20	52.6	4	10.5	6	15.8		
<b>Total level of breastfeeding</b>	<b>Good</b>	9	23.7	3	7.9	26	68.4	8	21.1	X <sup>2</sup> =11.78 P=0.003**	X <sup>2</sup> =17.47 P=0.000**
	<b>Fair</b>	22	57.9	14	36.8	9	23.7	20	52.6		
	<b>Poor</b>	7	18.4	21	55.3	3	7.9	10	26.3		
<b>Median (IQR)</b>		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
<b>Mean ± SD</b>		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.  
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.

**Table (3) Comparison between the study group regarding the level of breastfeeding at the 1st and 6th weeks postpartum (n=38).**

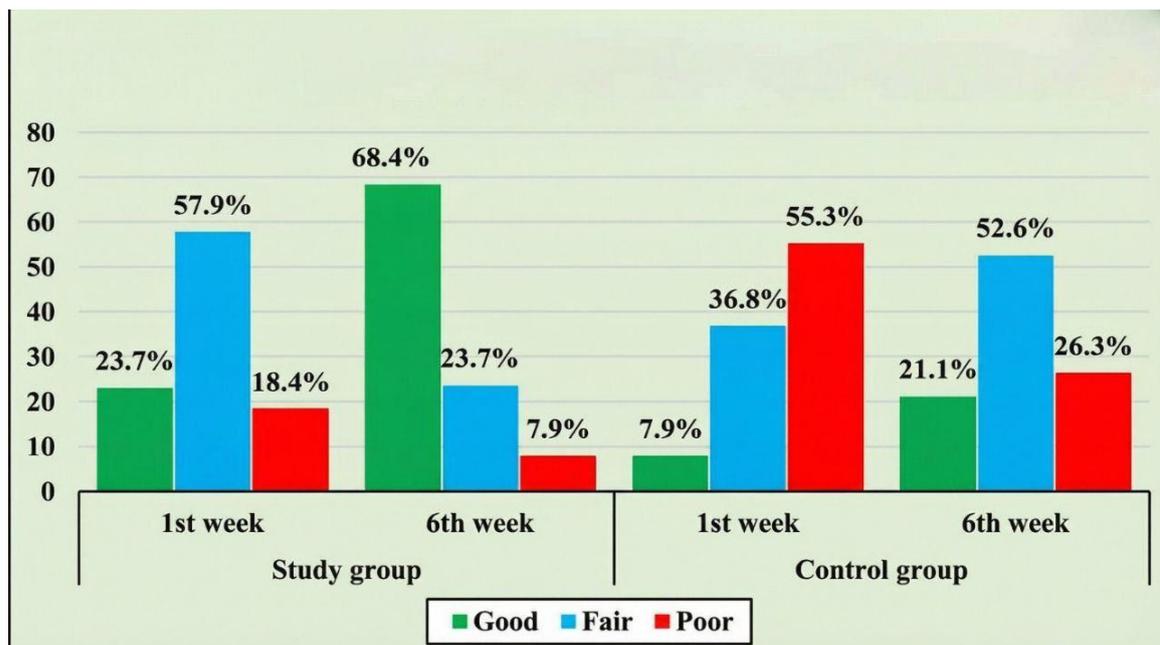
<b>Level of breastfeeding</b>		<b>Study group (n=38)</b>				<b>(p<sub>3</sub>)</b>
		<b>1st week</b>		<b>6th weeks</b>		
		<b>No.</b>	<b>%</b>	<b>No.</b>	<b>%</b>	
<b>Latch</b>	<b>Good</b>	14	36.8	25	65.8	X <sup>2</sup> =6.52 P=0.038*
	<b>Fair</b>	17	44.7	10	26.3	
	<b>Poor</b>	7	18.4	3	7.9	
<b>Audible swallowing</b>	<b>Good</b>	6	15.8	18	47.4	X <sup>2</sup> =8.93

	<b>Fair</b>	24	63.2	16	42.1	P=0.011*
	<b>Poor</b>	8	21.1	4	10.5	
<b>Type of nipples</b>	<b>Good</b>	10	26.3	21	55.3	X <sup>2</sup> =6.63 P=0.036*
	<b>Fair</b>	19	50.0	12	31.6	
	<b>Poor</b>	9	23.7	5	13.2	
<b>Comfort – Breast Nipple</b>	<b>Good</b>	11	28.9	25	65.8	X <sup>2</sup> =10.35 P=0.006**
	<b>Fair</b>	23	60.5	11	28.9	
	<b>Poor</b>	4	10.5	2	5.3	
<b>Hold – Positioning</b>	<b>Good</b>	8	21.1	21	55.3	X <sup>2</sup> =9.498 P=0.009**
	<b>Fair</b>	24	63.2	13	34.2	
	<b>Poor</b>	6	15.8	4	10.5	
<b>Total level of breastfeeding</b>	<b>Good</b>	9	23.7	26	68.4	X <sup>2</sup> =15.31 P=0.000**
	<b>Fair</b>	22	57.9	9	23.7	
	<b>Poor</b>	7	18.4	3	7.9	
<b>Median (IQR)</b>		5 (4.0-6.25)		8 (5.0-9.0)		Z <sup>2</sup> =3.751 P=0.000**
<b>Mean± SD</b>		5.39 ± 1.85		7.42 ± 2.26		

X<sup>2</sup>: Chi-square test. Z<sup>2</sup>: Wilcoxon Signed Ranks Test. IQR: Interquartile Range. SD: Standard deviation. P: P.

P<sub>3</sub>: P for comparing the (Study group) at the 1st week and 6th week.

**Figure (1): Percentage distribution of the study and control groups according to level of breastfeeding at the 1st week and 6th week postpartum.**



**Table 4: Comparison between the study and control groups regarding total maternal breastfeeding evaluation score at 6th week postpartum.**

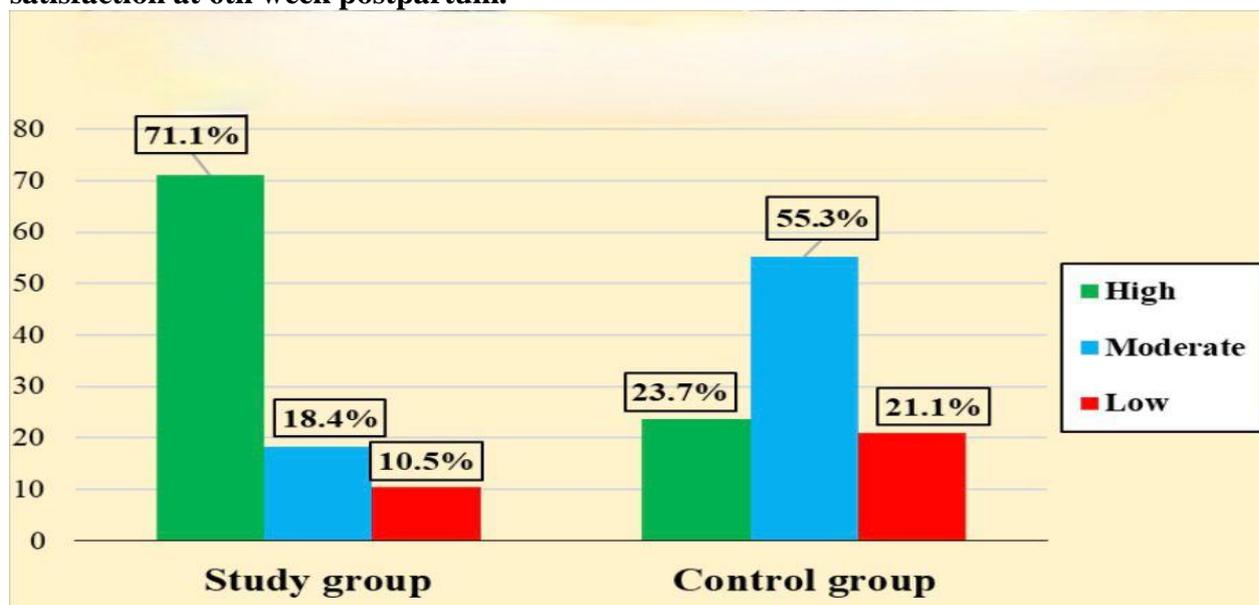
Items		Study group (n=38)		Control group (n=38)		X <sup>2</sup>	P
		No.	%	No.	%		
<b>Infant satisfaction and growth</b>	<b>High</b>	23	60.5	9	23.7	10.696	0.005**
	<b>Moderate</b>	9	23.7	19	50.0		
	<b>Low</b>	6	15.8	10	26.3		
<b>Maternal enjoyment and</b>	<b>High</b>	24	63.2	8	21.1	14.14	0.001**
	<b>Moderate</b>	8	21.1	20	52.6		

role attainment	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	High	27	71.1	9	23.7	17.33	0.000**
	Moderate	7	18.4	21	55.3		
	Low	4	10.5	8	21.1		
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			

X2: Chi-square test. Z: Mann-Whitney test. IQR: Interquartile Range. SD: Standard deviation. P: P.

Mean ± SD presented for descriptive purposes only; statistical comparisons based on median (IQR) via the Mann-Whitney U test.

**Figure (2): Percentage distribution of the study and control groups regarding total degree of satisfaction at 6th week postpartum.**



**Table (5): Correlation between total breastfeeding level and total maternal breastfeeding evaluation score at 6th 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= Correlation coefficient test. \*\*Highly significant Correlation at  $p < 0.01$ .

## Discussion

Mothers with flat or inverted nipples often face BF challenges because improper latch hinders early initiation of BF and result in is inadequate milk transfer, infant dissatisfaction, increased frustration, and possible early cessation of BF (*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. It improves nipple protrusion, facilitates proper latch, and enhances BF outcomes (*Özhüner et al. 2022*).

The present research was done to assess the effect of Hoffman's exercise on BF 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 family income.

These findings are consistent with those stated by *Ahmed and colleagues (2024)* in Egypt, who demonstrated that the control and study groups exhibited comparability in their basic demographic characteristics. Moreover, the current results are in agreement with *Fang et al. (2021)*, who noticed comparable general characteristics between the intervention and control groups ( $p>0.05$ ).

In addition, the present findings are closely aligned with the results of *Chowdhry et al. (2024)*, who indicated that the control and study groups exhibited comparability regarding baseline characteristics ( $p>0.05$ ), reflecting the homogeneity of the groups at the beginning of the study.

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 *Çerçer (2023)* in Turkey, who reported a mean age of  $24,20 \pm 4,40$  years of the investigated groups.

Also, this result was in agreement with *Paulsamy and colleagues (2021)* who studied "Effect of Hoffman's exercise on inverted nipples among primipara mothers, Saudi Arabia" and stated that the highest percentage of primiparous women (76.6%) of experimental group and (56.6%) of the control group were aged 21- 25 years.

Concerning the level of education, it was clear that nearly half of the study group and more than half of the control group had attained secondary education. This result was in the same line with *Belal and colleagues (2024)* in Egypt, who found that more than half of the participants were educated up to secondary level.

As regards residence, about 2/3 of the study group and control groups lived in rural areas. These observations were in accordance with studies by *Laksono and colleagues (2021)* and *Rakhimol and Jose (2024)*, which exhibited that most of the examined women were from rural areas.

Regarding occupation, it was clear that the majority of women in both the control and study groups were housewives. This result agreed with *Ahmed and colleagues (2024)* in Egypt and mentioned that the majority of studied women were housewives. Also, concerning type of family, it was clear that about 2/3 of women in both the control and study groups belonged to extended families. Similarly, *Taj and colleagues (2025)* found that three quarters of participants (75%) belonged to joint families in Egypt.

Regarding monthly income, it was clear that about, approximately half of the participants in each group stated not having enough monthly income. This result was agreed with *Abd-Ella and Mohammed, (2021)* in Egypt and found that more than half 60% and 56.4% of the control and study groups had not enough monthly income respectively.

Regarding total BF levels, the study group had higher mean scores as opposed to the control group at both the 1<sup>st</sup> and the 6<sup>th</sup> weeks PP. At the first week, the mean total BF scores were  $5.39 \pm 1.85$  for the study group as opposed to  $3.16 \pm 2.16$  in the control group, with about one-quarter of mothers in the study group achieving a good BF level as opposed 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 BF 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 BF 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 BF level increasing from about one-quarter to more than two-thirds.

These observations were in accordance with a research done by *Belal and colleagues (2024)* who stated 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 PP week, with continued progress throughout the PP 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 PP period.

These observations were in agreement with *Elkhatib and colleagues (2024)* who demonstrated that the majority of women achieved high level of BF, with the total mean level of BF 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.

Moreover, the results of current research were consistent with *Abd-Ella and Mohammed, (2021)* who stated that more than half of the women in the intervention group achieved good level of BF as opposed to less than 1/10 in the control group, with highly statistically significant differences between both groups regarding the LATCH BF scores categories ( $P < 0.001$ ).

Also, these observations were consistent with a research done by *Ahmed and colleagues (2024)* who found that after six

weeks of intervention, BF 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 of BF level was  $7.40 \pm 3.09$  in Hoffman's exercise group as opposed to  $5.32 \pm 3.72$  in the inverted syringe group, with statistically significant differences.

Also, these observations were consistent with *Paulsamy and colleagues (2021)* who exhibited that Hoffman's exercise was highly effective in improving BF levels, correcting flat or inverted nipples, and supporting the initiation and maintenance of early BF among primipara mothers ( $p = 0.001$ ).

Furthermore, this result agreed with *Çetindemir and Cangöl, (2024)* who found that the mean LATCH score increased from  $7.73 \pm 1.81$  before the intervention to  $8.66 \pm 1.61$  at 24 hrs and  $9.95 \pm 0.30$  at one month PP, with a highly statistically significant improvement in the mean LATCH scores of the study group during follow-up ( $P < 0.001$ ).

While, these observations were disagreed with a research done by *Hediger and Koenig, (2020)* who found that comparable improvement in BF rates at six weeks PP among women performing Hoffman's exercises as opposed to those who did not.

*From the researcher's perspective, Hoffman's exercise improved the overall BF 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 BF performance and potentially reduce early feeding difficulties.

These observations 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 BF than those who did not do it.

Concerning the Maternal BF Evaluation Score at six weeks PP 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  $100.84 \pm 30.2$  as opposed to  $79.68 \pm 25.65$  the control group, with a highly statistically significant difference between both groups. In addition, the majority of mothers in the study group stated 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 observed in a research done by *Elkhatib and colleagues (2024)* who stated that near to half and more than one quarter of women in the study group were either very satisfied or satisfied respectively, as opposed to only a small proportion and less than 1/10 of women in the control group after Hoffman's exercise, with a highly statistically significant difference between both groups.

Also, these observations were in consistent with a research done by *Abd-Ella and Mohammed, (2021)* who found that more than 1/3 and more than 1/4 of participants in the intervention group were either strongly satisfied or satisfied respectively, as opposed to only small proportion of the control group after intervention, with a highly statistically significant difference between both groups ( $p < 0.001$ ). Also, these observations were in accordance with research done by *Murugesan and Tripathy, (2022)* who assessed maternal satisfaction at 6 weeks PP via 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 BF success.

Comparable findings were observed in research done by Bizon and colleagues (2023), who noted that higher maternal satisfaction at one month PP was associated with longer duration of EPF and lower risk of early BF interruption, which highlights that maternal satisfaction is an important predictor of BF success.

Comparable findings were observed in a research done by *Ningsih and colleagues (2025)* who exhibited a significant improvement in maternal satisfaction between the pre-test and post-test assessments, with all women showing increased BF satisfaction ( $P < 0.001$ ), which indicate that supportive interventions can positively influence mothers' satisfaction with BF.

*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 observations indicate that the exercise supports both successful BF and maternal psychological well-being, which boost mothers' confidence and overall satisfaction with the BF experience.

These observations supported 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 BF than those who did not do it".

Concerning relations between studied variables, BF 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 week PP. On the other hand, BF 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 PP. Age and residence exhibited comparable associations in both groups.

Comparable findings were observed in a research done by *Laksono and colleagues (2021)* who found that higher maternal education levels significantly increased the likelihood of EPF.

These observations were similar to *Elbehisy and colleagues (2022)* who revealed that EPF had a significant relation with maternal employment and socioeconomic state. Also, these observations were nearly similar to *Srivastava and colleagues (2024)*, who found that the type of family, maternal education, and socioeconomic status were significant determinants of good BF practices ( $P<0.05$ ).

The current results disagreed with *RAUT and colleagues (2025)*, who found a comparable association between the level of successful BF in Hoffman's exercise and sociodemographic variables such as education, occupation, and family income among primiparous women.

The current study's findings on the correlation coefficient between total BF 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 BF level and total MBFES at the sixth week PP.

These observations were consistent with *Nabulsi and colleagues (2021)*, who demonstrated that mothers who implemented EBF were substantially more satisfied with their overall and subscale scores than mothers who partially breastfed or did not breastfeed, highlighting the association between successful BF and maternal satisfaction.

These observations were in agreement with *Vaithilingan and colleagues (2023)*, who exhibited a positive correlation between BF self-efficacy and maternal satisfaction

among primiparous mothers ( $P<0.001$ ), which indicates that higher maternal confidence and competence in BF are associated with greater BF satisfaction.

These observations were consistent with *Escribano et al. (2024)*, who found that higher maternal satisfaction, as measured by the MBFES, exhibited positive associations with BF rates.

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

### **Conclusion**

Mothers in the study group demonstrated a marked enhancement in overall BF performance and maternal satisfaction as opposed to those in the control group after the implementation of Hoffman's exercise. Furthermore, a highly statistically significant positive association was observed between overall BF level and maternal satisfaction in the research and control groups. Consequently, the objectives of the research were fulfilled, and the stated research hypotheses were confirmed.

### **Recommendations**

- The application of Hoffman's exercise is advised as an effective approach for the management of flat and inverted nipples to promote improved BF outcomes.
- Hoffman's exercise should be incorporated into standard antenatal and postnatal nursing practices for mothers identified as having flat or inverted nipples.

### **Recommendations for Future Research**

- Future studies should be done across diverse clinical settings and involve larger sample sizes to improve the robustness and generalizability of the research findings.
- Additional comparative research is recommended to investigate Hoffman's exercise effectiveness relative to other

nipple correction interventions in improving BF outcomes among mothers with inverted nipples.

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