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Conservative Nursing Interventions to Mothers for Prevention of Nonsynostotic Plagiocephaly and its Efficacy on their Infants' Motor Development

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Abstract
Background: Non-synostotic Plagiocephaly is acquired cranial asymmetry that has a significant impact on the cosmetic appearance of the infant's head and great concern to parents. Therefore, this study **aimed** to investigate the effect of conservative nursing interventions to mothers for prevention of Nonsynostotic Plagiocephaly and its efficacy on their infants' motor development. **Design:** Quasi-experimental was utilized. **Settings:** This study was carried out at Ash-moon Health Office in El Menoufia Governorate. **Sample:** A purposive sample of 75 mothers & their infants who attended in Menoufia the previously mentioned setting from the period of January to December 2021. **Tools:** Data were collected using the three following tools: **Tool one:** Structured interviews questionnaire for mothers was used to assess mothers' knowledge about Non-synostotic Plagiocephaly. **Tool two:** Mothers' reported practices about prevention of Nonsynostotic Plagiocephaly. **Tool three:** Clinical observation sheet for infants**. Results:** There were highly statistically significant differences improvement of mother's knowledge and reported practices mean scores about prevention of Non-synostotic Plagiocephaly in the post and follow-up tests $p < 0.001$. There were significantly differences found in the mean scores of infants' motor development. **Conclusion:** The conservative nursing interventions had significant effect on improving mother's knowledge and reported practices regarding prevention of Non-synostotic Plagiocephaly & consequently on their infants' motor development. **Recommendation:** Awareness educational program should be applied on a regular base to develop the knowledge and practice of parents about the prevention of Non-synostotic Plagiocephaly among their infants.

Keywords: Conservative Nursing intervention, Infants, Motor development & Non-synostotic Plagiocephaly,

Introduction
Non-synostotic Plagiocephaly (NSP) is a kind of acquired cranial asymmetry caused by prolonged external strain on an infant's skull **(Burmeister et al., 2021).** The contact force of the skull prevents growth in the contact area and pushes it to locations with little resistance. It's frequently associated with anterior ear displacement on the same side, opposite-side parietal protuberances, ipsilateral frontal protuberances, and partner frontal flatness **(Charalambous et al., 2021).** Estimates of its prevalence range from 3% to 48% **(Ballardini et al., 2018).** As stated by the American Academy of Pediatrics (AAP), one out of every four children in the United States has a positional head malformation **(Collett et al., 2019).** The NSP was attributed to male gender, supine sleep posture, imperfect neck rotation or infant preference for head position, firstborn, lower newborn activity level, absence of tummy time, and older mothers' age **(De Bocket al., 2017).** All angles of the infant should be evaluated, including the anterior, posterior, and vertex. Looking at the infant starting from the front (facial view), the cheeks, eyes, and ears are evaluated for symmetry. **(Fenton & Gaetani, 2019)**. Infants with posterior deformational plagiocephaly (brachycephaly) have a big head, and the skull may be visible over the ears. From behind, check the symmetry of the base of the skull for occipitomastoid bulging, which could indicate lambdoid suture craniosynostosis. Look for symmetry between the right and left sides, as well as any flatness, from a vertex view (bird's eye), as shown by **Cevik & Isik, (2020).** Plagiocephaly correlated developmental disabilities for example cognitive delays, ocular misalignment, and motor delays, are distinct to the area of expertise of occupational therapists **(Collett et al., 2019).** Because the skull is easily mouldable in the first few months of birth, conservative management measures including repositioning, physical therapy, and cranial moulding devices can safely and successfully prevent or reduce the degree of skull asymmetry when used in the first year **(Wu et al., 2017).** Nurses are in a unique position to assess mothers' ability to follow Plagiocephaly prevention, provide nursing intervention guidelines, observe mother alternate new-born's head positioning while sleeping, exhibit sternocleidomastoid muscle activity, and administer tummy time for new-borns during waking hours.

An important nursing function is allowing parents to express their concerns and opinions regarding their child's health status, as well as providing best practice **(Hocenberry et al., 2017).**

Parents and caregivers are the most likely people to notice a malformation in their infants' head shape and report it to their paediatrician. Parents and caregivers aren't often aware that their infants have Plagiocephaly. According to research, early parent and caregiver education improves Plagiocephaly awareness and prevention **(Ryall et al., 2021).** Family- centered treatment is thought to be the best option for early intervention. The value of parental insights into their child's abilities and needs has become more widely recognized, as has the family's role in a child's life **(Lawrence et al., 2015).** As a result, parental involvement and enhanced understanding of literature-based recommendations for early introduction of head counter-positioning and cot location, as well as supervised play in prone or tummy-time' when the newborn is awake, are crucial. Parents and caregivers may easily use Tummy Time because it is short, effective, and inexpensive. Tummy Time occurs two to three times per day when an adult plays and interacts with an infant who is positioned in a prone posture while awake. Neck stretching exercises for torticollis are included in the Tummy Time program. Sliding on the abdomen, crawling, and elevating the head and neck are just a few of the developmental skills that these activities improve infant's motor development **(American Academy of Pediatrics, 2017).** Even though positional Plagiocephaly is associated to impairments in gross motor, fine motor, problem-solving, and personal social abilities, developmental assessment should be included when screening babies with Plagiocephaly. For this reason, newborns with Plagiocephaly should be continuously monitored. Early referral to early intervention therapies like physiotherapy can help to alleviate motor deficits and identify infants who may have longer-term developmental problems **(Martiniuk et al., 2017)**

Significance of the study

In a prospective non-randomized study, **Fontana et al., (2016)** reported that Plagiocephaly is a malformation that causes developmental delays. They found that children with Plagiocephaly have a higher rate of compound language and compound motor scale developmental delays than the general population. These delays have a current impact on the baby's functional participation in the natural environment; it is highly common in healthy full-term infants **(Ballardini et al., 2018)**. Nonsynostotic Plagiocephaly is a condition in which a portion of a baby's head develops a flat patch on one side or the back. The syndrome is common and is easily treated and prevented with a few simple practices, so increasing the mothers' knowledge and practices about NSP is very important.

Aim of the study:

The current study aims to investigate the effect of conservative nursing interventions to mothers for prevention of Nonsynostotic Plagiocephaly and its efficacy on their infants' motor development.

Objectives

- Assessing mothers' knowledge and reported practices regarding prevention of Nonsynostotic Plagiocephaly.
- Designing and implementing conservative nursing interventions regarding prevention of Nonsynostotic Plagiocephaly.
- Evaluating the effect of the conservative nursing interventions on mother's knowledge, and reported practices regarding prevention of Nonsynostotic Plagiocephaly & consequently on their infants' motor development.

Research hypothesis: The following hypotheses were formulated in order to achieve the study aim:

Hypotheses 1: Mothers' knowledge would increase post-implementation of conservative nursing interventions concerning prevention of Nonsynostotic Plagiocephaly.

Hypotheses 2: Mothers' practices would improve post-implementation of conservative nursing intervention regarding prevention of Nonsynostotic Plagiocephaly.

Hypotheses 3: infants' motor development would improve post-implementation of conservative nursing intervention regarding prevention of Nonsynostotic Plagiocephaly.

Subjects and Method

Research Design: In this study, a quasi-experimental research design was used.

Setting:

This study was done at Ash-moon Health Office in El Menoufia Governorate which is one of El Menoufia largest Health Office for children care services as vaccination, receiving artificial milk, examination and treatment. It is affiliated to ministry of health and population

Sampling:

A purposive sample included 75 mothers who attended in the previously mentioned setting for vaccination of their newborns.

The sample size was determined using the GRANMO calculator **(Marrugat, 2012),** with the means option selected, the population estimation option selected, a confidence level of 0.95, a reference population size of an infinite population assumed, an expected standard deviation of 2.98, and a desired accuracy of

0.7. A total of 80 people were gathered as a minimum. However, data was collected from 75 subjects as they met inclusion and exclusion criteria.
The mothers were recruited to the study according to the following criteria:

Inclusion criteria:

- Mothers were willing and had ability to participate in the study.
- Mothers aged 18 years of age or older.
- Mothers had healthy infant from both gender.

Exclusion criteria:

Mothers had Infants with dysmorphic features or craniosynostosis deformities, neurological disorders, or neonatal intensive care unit admissions.

Tools of data collection:

The following three tools were used to collect data:

Tool one: Structured interview questionnaire for mothers

It was written in simple Arabic language and consists of three parts, which were prepared by the researcher after reviewing related literature.

Part I: Demographic characteristics of infant and their mothers. For infants, it covered age, gender, mode of delivery and sleep duration. For mothers such as age, level of education, children number, and attendance of training programs about NSP.

Part II: Characteristics of safe position for infants. It consisted of 5 questions (Sleep position, head position during sleep & awaking, Kind of mattress, and type of feeding) that were responded to MCQ basis then calculated according to the mothers' response and expressed as number and percentage.

Part III: Mothers' knowledge about Nonsynostotic Plagiocephaly, this part was consisted of 10 questions (Definition, causes, types, risk factors, clinical manifestations, diagnosis, treatment, Instruments used for treatment, duration for recovery, and re-positioning strategies to prevent head flattening).

Scoring system

The scoring structure for the instrument was developed; the correct answer received one and the incorrect answer received zero. If the percentage score was 60 % or higher, the mothers regarded a satisfactory knowledge, and if the percentage score was less than 60 %, they were judged unsatisfactory knowledge.

Tool two: Mothers' reported practices about prevention of Nonsynostotic Plagiocephaly adopted from **Lennartsson & Nordin (2019), American Academy of Pediatrics, (2017).** Mothers' reported practices about NSP were assessed through this part (38 items):- It involved tummy time (4 steps), repositioning the infant to the right and left side (6 steps) , alternating arm when feeding (6 steps), Promote sleep cradling (6 steps), repositioning the Infant during a awake and sleep time (7 steps) , Use pillow (4 steps), and assessment of head shape (5 steps).

Scoring system: Mother's reported practices were scored as follows: Each done complete practice obtains 2 points, each done incomplete practice obtains 1 point, and the not done practice obtains 0 points. The mothers' practices were considered adequate when the percent score was ≥ 50% of the total score and inadequate when the percent score was < 50% of the total score (76).

Tool three: clinical observation form for infant: It consisted of three parts:

Part I : Argenta's assessment tool, it was adopted from **Argenta et al.,, (2004)** to define the prevalence of NSP, Reliability, validity, simplicity, and convenience of use were all put to the test. The author defines five stages of occipital Plagiocephaly, ranging from mild to severe deformity: Type I deformation just affected the back of the skull, type II included deformity and malposition of the affected ear, and type III comprised deformity of the posterior cranial asymmetry, malposition of the ear, and prominence of the frontal eminence ipsilateral to the flat area., Deformity of posterior cranial asymmetry, malposition of the ear, and frontal and facial ipsilateral asymmetry were all part of type IV, and type V added either occipital lift or temporal bulging.

Part II: **Alberta Infant Motor Scale (AIMS)** was derived from **Piper & Darrah, (1994)**, a norm-referenced observational measure reflecting the gross motor maturation of infants from birth to walking. It measured with documented validity and reliability. It consisted of 42 items that were evaluated in three positions: prone (21 items), supine (9 items), and sitting (12 items). Items were given a score based on a set of criteria (weight-bearing, antigravity movements, and postural alignment). One point was provided for each item observed ,while zero was given if the item was not observed at all. The total raw scores, which ranged from 0 to 42, were the sum of all the observed items. The percentile ranks of total raw scores were used to classify infant motor ability as normal, suspicious, or abnormal. Normal motor behavior was indicated by scores above the 16th percentile, suspicious motor activity was indicated by scores between the 16th and 5th percentiles, and abnormal motor behavior was indicated by scores less than the 5th percentile.

Part III: Measurement of head circumference was guided by **Lissauer, (2015), World Health Organization, (2014), and Nortiz & murphy (2013).** Head circumference is measured with a nonstretchable tape measure to obtain three measurements of the occipital–frontal circumference (OFC). Accuracy of this measurement depended on

encircling the head at the widest occiput prominence and anteriorly 1 to 2 cm above the glabella space at the largest frontal prominence. The average OFC at 40 weeks gestational age was 35 cm. The OFC ranged from 33 to 37 cm between the 3rdth and 97th percentile. Before closure of the fontanels, the measurement of the OFC is an indirect measure of intracranial contents, including the brain, cerebrospinal fluid, cerebral blood volume, and bone. According to WHO growth charts, head circumference was categorised as follows: Head circumference for age girls' birth to two years (percentiles) and head circumference for age boys' birth to two years (percentiles) as a function of age:

- **Small (**Head circumference ≤ 3rd percentile)
- **Normal** (Head circumference between 3rd and 97rd percentile)
- **Large** (Head circumference ≥ 97rd percentile)

Validity and Reliability

The validity test was performed by two experts in Pediatrics in Faculty of Medicine, Port Said University and three professors of pediatric Nursing Faculty of Nursing, Port Said University and Menoufia. The reliability of the mother's knowledge questionnaire was confirmed by Cronbach's alpha coefficient (alpha =0.85 for the mother's Knowledge Questionnaire and Alpha = 0.92 for the mother's reported practice).

Pilot study:

It was conducted on 10% of the sample (7) and interviews were conducted to assess the tool's practicability, applicability, consistency, clarity, and practicality in order to estimate the time required to complete them.

Ethical considerations

The appropriate authoritative personnel gave their official consent the researcher was obtained the approval oral consent from each mother for her participation after explaining the aim of the study and securing confidentiality of data. The mothers were able to withdraw from the study at any time without any responsibilities

Fieldwork:

Assessment phase

The actual field work took place over a twelve-month period, from beginning in January 2021 to the ending of December 2021. The researcher was available during BCG vaccination days to take the infants in the first days in the previously mentioned setting throughout the morning shift. The researchers introduced themselves to the mothers and explained what the study was all about. Mothers were motivated by baby oil, diaper, and wipes funded by researchers'. According to their available time, each mother was questioned individually. Mothers were encouraged to try to prevent NSP at the beginning of the study. Researchers asked the mothers to fill in tool 1 and it took 15 minutes (pre-test). The reported practices were assessed by the researchers through asking the mothers to re-demonstrate their practices. The average time required to complete all checklists was ranged between 25- 40 minutes. Assess the prevalence of NSP, head circumference was measured, and motor development of infants was assessed by using tool three. The assessment phase took three months to collect all of the necessary data. The programme objectives were created after identifying areas of weakness in mothers' knowledge and practices.

Implementation phase

Conservative nursing intervention designed by the researchers using a base line information in assessment phase.it was written in simple Arabic language. Mothers were allocated into small group sessions (each group was interviewed in the morning according to their availability) for three sessions. Auditory (verbal instructions, answering question sessions, and feedback), kinesthetic (demonstration and hands-on practice), and visual (video, written instructions, and learning materials translated into the Arabic language) teaching modalities were used. Each session was between 25 and 30 minutes long. Three sessions of theoretical and practical assistance were given to each group contained of three to four mothers as the following: the first session, Theoretical knowledge was included (definition, causes, risk factors, types, clinical manifestations, diagnosis, treatment, and prevention of NSP). The second session included preventive counselling (anticipatory guidance), mechanical adjustments, and exercise (positioning, tummy time, and physical therapy). The third session, (practical) was included demonstration of head position using the infant or a doll, and reinforcing learning with hands-on practice to accomplish occipital pressure relief when infants are awake, a sleep, being fed,screening and recognizing cranial asymmetry and emphasizing practice with hands-on training. Researchers concluded each session by summarizing the main points and providing positive verbal feedback. At the end of the last session, each mother received an Arabic informational booklet with theoretical and practical sections in order to increase their remembering and knowledge.

Evaluation phase

After conservative nursing intervention, tool one and two were re-implemented immediately and after four months after completion of the program to assess Mothers' knowledge and practices, regarding prevention of NSP. Researchers using Argenta's assessment tool to assess the prevalence of NSP, head circumference measure, and Alberta Infant Motor

Scale to assess motor development were performed for infant to identify any particular dysmorphic features or associated

Statistical Design:

The data was analysed using IBM Statistical Package of Social Science (SPSS) version 26. Descriptive statistics such as frequency distribution, percentage, means, and standard deviations were used, while inferential statistics such as chi-square and t-test were used. Analysis of variance (ANOVA of F test) used for comparison of means of more than two group. The significance level was established at p 0.05, and the level of extremely significant was set at p 0.001. All statistical significance tests were based on a two-sided hypothesis test, with p 0.05 being considered significant.

Results

Table (1): Frequency distribution of the studied mothers regarding to their demographic Characteristics (No=75)

Demographic characteristics	No=75	%
Maternal age (Years)		
20 -<	9	12
25 -<	3	4
30 -<	15	20
35 <	34	45.3
< 40	14	18.7
Mean ± SD: 35.41 ± 6.33		
Education Level		
Primary School	4	5.31
Preparatory School	9	12
Secondary School	17	22.8
Technical Institute	20	26.8
Bachelor Degree	25	33.3
Number of children		
2	24	32
3	38	50.7
4	3	4.0
5	10	13.3
Training sessions about NSP		
Yes	0	0.0
No	75	100

Table (2): Distribution of the studied Infants demographic characteristics (No=75)

Demographic characteristics	Frequency no=75	Percentage %
Age (days)		
0 < 2	16	21.3
2 < 4	29	28.6
4 - < 6	10	13.3
6 - < 8	21	26.7
Mean ± SD: 3.54 ± 3.02		
Mode of Delivery		
Vaginal	34	45.3
Cesarean section	41	54.7
Sleep duration in hours per day		
10 – 15	47	62.6
15 - 20	28	37.4

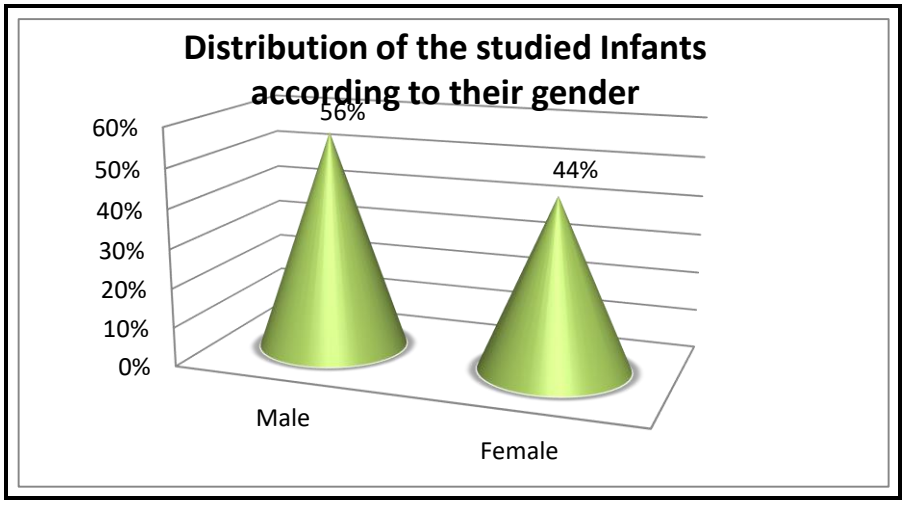

Figure (1): Distribution of the studied Infants according to their gender

Table (3): Characteristics of safe position for infants as reported by the studied mothers

Positions	Frequency	%
Sleep position		
a. Supine	20	26.7
b. Prone	25	33.3
c. Side-lying position	30	40
Head position during sleep		
a. Supine	24	32
b. Side-lying position	51	68
Head position during awaking		
a. Bck	39	52
b. Side-lying position	36	48
Kind of mattress		
a. Hard	13	17.3
b. Soft	62	82.7

Table (4): Distribution of the studied mothers' knowledge regarding NSP in the pre, post and follow-up the conservative nursing interventions (No=75)

Knowledge	Time						X^2 (P value 1)	X^2 (P- value 2)
	Pre no=75		Post no=75		Follow-up no=75			
	No	%	No	%	No	%		
Definition of NSP								
a. Correct	52	69.3	75	100	73	97.3	36.99	7.43
b. Incorrect	23	30.7	0	0.0	2	2.7	**(000*)**	**(.006*)**
Causes of NSP								
a. Correct	27	36	73	97.3	68	90.7	.391	1.47
b. Incorrect	48	64	2	2.7	7	9.3	**(.532^{ns}**	**(.225^{ns})**
Types of NSP								
a. Correct	38	50.7	72	96	64	85.3	.373	.779
b. Incorrect	37	49.3	3	4	11	14.7	**(.541$^{ns)}$**	**(.378$^{ns)}$**
Risk factors of NSP								
a. Correct	13	17.3	70	93.3	56	74.7	1.04	.148
b. Incorrect	62	82.7	5	6.7	19	25.3	**(.306^{ns})**	**(700^{ns})**
Clinical manifestation of NSP								
a. Correct	18	24.0	75	100	54	72	3.95	2.64
b. Incorrect	57	76	0	0.0	21	28	**(.047*)**	**(.104^{ns})**
Diagnosis of NSP								
a. Correct	6	8	71	94.7	60	80	3.37	.911
b. Incorrect	69	92	4	5.3	15	20	**(.072)**	**(340^{ns})**

Knowledge	Time						X^2 (P value 1)	X^2 (P- value 2)
	Pre no=75		Post no=75		Follow-up no=75			
	No	%	No	%	No	%		
Treatment of NSP								
a. Correct	10	13.3	69	92	56	74.7	.911	.558
b. Incorrect	65	86.7	6	8	19	25.3	**(.340 ns)**	**(.455 ns)**
Instruments used for treatment								
a. Correct	6	8.0	73	97.3	73	97.3	1.57	.731
b. Incorrect	69	92	2	2.7	2	2.7	**(.210ns)**	**(.393 ns)**
Duration for recovery								
a. Correct	3	4	72	96	72	96	4.66	1.77
b. Incorrect	72	96	3	4.0	3	4.0	**(.183ns)**	**(.031*)**
Re-positioning strategies to prevent head flattening.								
a. Correct	18	24	73	97.3	66	88	.245	1.37
b. Incorrect	57	76	2	2.7	9	12	**(.269ns)**	**(.240 ns)**

P1: between pre and post *P2: between pre and follow-up* *(**) highly significant p <0.001*
(*) statistically significant at p ≤ 0.05 *(ns) No significant p > 0.05*

Table (5): Distribution of the studied mothers' regarding to their reported practice of NSP prevention in the pre, post and follow-up the conservative nursing interventions (No=75)

Mothers' Reported Practice	Pre-test no=75		Post-test no=75		Follow-up no=75		X^2 (P- value 1)	X^2 (P- value 2)
	No	%	No	%	No	%		
Incorporate Tummy Time into daily activities								
a. Done complete	25	33.3	73	97.3	65	86.7	.353	1.98
b. Done in complete	14	18.7	2	2.7	10	13.3	**(.552ns)**	**(.159ns)**
c. Not done	36	48	0	0.0	0	0.0		
Repositioning the Infant to the Right and left side								
a. Done complete	0	0.0	71	94.7	63	84	.238	.116
b. Done in complete	20	26.7	4	5.3	12	16	**(.626ns)**	**(.734 ns)**
c. Not done	55	73.3	0	0.0	0	0		
Alternate arm when feeding								
a. Done complete	4	5.3	72	96	68	90.7	.655	.647
b. Done in complete	7	9.3	3	4	7	9.3	**(.418ns)**	**(.421 ns)**
c. Not done	64	85.3	0	0.0	0	0.0		
Promote Sleep Cradling								
a. Done complete	3	4.0	70	93.3	62	82.7		
b. Done in complete	3	4.0	5	6.7	13	17.3	.551	1.61
c. Not done	69	92	0	0.0	0	0	**(.458ns)**	**(.203 ns)**
Repositioning the Infant during a awake and sleep time	0	0.0	69	92	67	89.3		
a. Done complete	7	9.3	6	8	8	10.7	.414	.038
b. Done in complete	68	90.7	0	0.0	0	0	**(.520ns)**	**(.846 ns)**
c. Not done								
Use pillow								
a. Done complete	0	0.0	67	89.3	59	78.7	.223	.269
b. Done in complete	3	4.0	8	10.7	16	21.3	**(.637ns)**	**(.605 ns)**
c. Not done	72	96	0	0.0	0	0.0		
Assessment of head shape								
a. Done complete	0	0.0	65	86.7	62	82.7	75.0	55.0
b. Done in complete	0	0	10	13.3	13	17.3	**(.000*)**	**(.000*)**
c. Not done	75	100	0	0	0	0.0		

(*) highly statistically significant at p ≤ 0.001 *P1: between pre and post* *P2: between pre and follow-up*
(ns) No significant p > 0.05

Table (6): Comparison of the mean- Alberta Infant Motor Scale scores of in the infants at ages 2, 4, 6 months (No=75)

Motor development	Age (months)			f	p value
	2 months No=75	4 months No=75	6 months No=75		
	Mean ± SD	Mean ± SD	Mean ± SD		
Prone	18.88 ± 1.34	19.78 ± 1.56	19.54 ± 1.85	643.31	P=.000*
Supine	9.00 ± 0.00	9.00 ± 0.00	9.00 ± 0.00	-	-
Sitting	10.33 ± 1.5	11.96 ± 0.61	11.74 ± 0.61	962.92	P= .000*

(*) statistically significant at p ≤ 0.001 *# ANOVA test wasused*

Table (7): Head circumferences measurements among the studied infants (No=75).

Age	Head circumference (H.C)						f	p-value
	H.C≤ 3rd percentile		H.C between 3rd and 97th percentile		H.C ≥ 97th percentile			
	No	%	No	%	No	%		
2 months	3	4	70	93.3	2	2.6	136.8	.000*
4 months	2	2.6	71	94.6	2	2.6	131.5	.000*
6 months	1	1.3	71	94.6	3	4	125.2	.000*

(*) statistically significant at p ≤ 0.001 *# ANOVA test was used*

Table (8): Total Mean score of the studied mother's knowledge, and reported practice about NSP pre, post and follow-up the conservative nursing intervention (No=75)

Items	Maximum score	Pre-test	Post-test	Follow-up test	f	P-Value
		Mean ±SD	Mean ±SD	Mean ±SD		
Knowledge	10.00	2.54±2.90	9.66±1.31	8.57±2.67	91.50	0.000*
Practice	76.00	7.65±.12.09	72.92±.10.04	70.50±.12.45	52.94	0.001 **

(**) statistically significant at p ≤ 0.001 *# ANOVA test was used*

Table (1): Describes frequency distribution of the studied mothers in relation to their demographic characteristics, it was demonstrated that their mean age was 35.41 ± 6.33 and less than half of the studied mothers (45.33%) aged between 35- < 40 years old while, 20% of them were aged 30 < 35 years old. Also, none of the studied mothers had previous training sessions about NSP.

Table (2): Focuses on distribution of the studied infants regarding to their demographic characteristics, it was exemplified that their mean age was ± SD 3.54 ± 3.02 days. More than one quarters of the studied infants aged between 2 < 4 and 6 - < 8 days (28.6% and 26.7% respectively)**.** More than half of the studied subjects born by Cesarean section (54.7%) and more than half of the studied sample slept 10-15 hours (62.6%).

Figure (1): Illustrated that more than half of the studied infants were males (56%).

Table 3: reflects the characteristics of safe position for infants as reported by the studied mothers, it was revealed that 40% of infants were lying in the side-lying position. While, one- third of them lied in the prone position (33.3%) and 26.7% of them were in the supine position. Also, more than two-thirds (68%) of the infants were lie on side-lying position during sleep (68%).

Table (4): Displays the frequency and percentage distribution of the studied mothers' Knowledge regarding NSP in the pre, post & follow-up the conservative nursing interventions. Generally, it was found that the percentages of mothers correct answer increased in the post test and follow up compared to the pre conservative nursing intervention with no statistically significant differences related all items in the table except two of them . There was statistically significant difference in mother's knowledge between the pre and the post conservative nursing intervention related definition of NSP, P 1=0.000 while statistically significant differences were found between the pre & follow-up 3 months after the conservative nursing intervention related items of definition of NSP and duration for recovery, P2=0.000 and 0.031 respectively

Table (5): Reflects the distribution of the studied mothers' regarding to their reported practice of NSP prevention in the pre, post and follow-up conservative nursing interventions. Generally, it was found that the

percentages of mothers completely done practices increased in the post test and follow up compared to the pre conservative nursing intervention with no statistically significant differences related all items in the table except one. There was statistically significant differences in mother's reported practices between the pre and the post conservative nursing intervention as well as between the pre and the follow up 3 months after the conservative nursing intervention related item of assessment of head shape. P1 and P2 =0.000

Table (6): Presents the outcome measures of the studied infants' gross motor development pre, post, & follow–up tests, it was shown that there were significantly differences found in the AIMS subscales with higher scores in motor skills (prone and sitting) on the post and follow-up tests. However, motor behavior was normal for all the infants on pre, post, & follow-up the conservative nursing intervention as indicated by their scores which plotted above the 16th percentile

Table (7): Shows head circumferences measurements among the studied infants. It was clarified that at the second month, 4 % of infants' head circumference plotted below the 3rd Percentile and 2.6% of them their head circumference plotted in ≥ 97th percentile. While at the 6th month , the table demonstrates that 1.3% of infants' head circumference plotted below the 3rd Percentile and 4% of them their head circumference plotted in ≥ 97th percentile Furthermore, there were statistically significant differences in measurement of infants' head at 2, 4 and 6 months of age ($p \leq 0.001$).

Table (8): Shows that the total Mean score of the studied mother's knowledge and reported practice about NSP pre, post & follow-up the conservative nursing intervention , it was discovered that there were noticeable improvements of mean ± S.D in the scores of knowledge and reported practices about prevention of NSP on the post &follow-up the conservative nursing intervention . As well as, there were statistical significant differences between mothers' knowledge and reported practice at 0.001 of statistical significance.

Discussion

Regarding the distribution of infants' demographic characteristics, it was illustrated that mean ± SD of infants' age per days was 3.54 ± 3.02 and more than one quadrant of them aged between 2 < 4 and 6 - < 8 days. Therefore, it is vital to endorse early educational programs to reduce the likelihood of developing Plagiocephaly. The present findings showed that more than half of the studied infants were born by Cesarean section . This was in contrast with **Mawji et al., (2014)** who revealed 30.2% of mothers underwent a Cesarean section. According to the distribution of infants according to gender, it illustrated that more than half of the studied infants were males. This finding is in the line of **Pastor-Pons et al., (2021)** study who reported that 43.2% were females and 56.8% were males.

Babies need sleep to grow and develop well. For newborns this is usually 14-17 hours in every 24 hours**.** But sleep patterns can vary a lot. **(Dias et al., 2018).** More than half of the studied infants slept from 10-15 hours. This study came in agreement with **Burmeister et al., (2021)** who stated that the majority of the infants slept between 5– 10 or more hours per night ,and that extended supine sleeping and long supine slept time were associated with NSP. As a result, it's critical to point out that turning the head to one side can weaken the contralateral muscles, resulting in a limited active range of motion (such as in congenital muscular torticollis). This was similar to other study conducted by **Leung et al., (2017).**

Regarding the characteristics of safe position for infants, the present study showed that more than half of the studied mothers thought that side lying position was a recommended sleeping position. This was opposed with **Isezuo et al., (2017)** who cited that the minority of studied mothers correctly identified the recommended position as supine. In this context, **De Bock et al., (2017)** illustrated that the most common risk variables for NSP were back sleep position, imperfect neck rotation or favourite in head position, firstborn, minor baby activity level, and absence of tummy time.

As regard mothers' knowledge about NSP, findings of the present study revealed that generally, the percentages of mothers correct answer increased in the post and follow up compared to the pre conservative nursing intervention with no statistically significant differences related all items in the table except two of them. There was statistically significant difference in mother's knowledge between the pre and the post conservative nursing intervention related definition of NSP, P 1=0.000 while statistically significant differences were found between the pre & follow-up 3 months after the conservative nursing intervention related items of definition of NSP and duration for recovery, P2=0.000 and 0.031 respectively. These findings indicate the effectiveness of the conservative nursing intervention on improving level of knowledge among mothers. In this respect, **Ballardini et al., (2018)** highlighted the importance of increasing NSP prevention through consistent messages delivered prenatal and postnatal by various health practitioners. All of these findings opened the way for health care providers to explore importance of teaching families about NSP, conducting formal screenings, and measuring infants during well-baby

visits in order to ensure NSP prevented or treated. Similar, **Ellwood et al., (2020)** found that knowledge, assistance, and support were likely to reassure and assist parents in the prevention of Plagiocephaly. These findings suggest that nurse interventions and obtaining written material (Informational booklet) may help parents remember and understand what happened. Also, according to **Lennartsson, (2020)** study who found that the intervention group of parents had a thorough knowledge of NSP prevention at four months. As a result, continuous educational programmes on NSP prevention and new-borns repositioning measures should be implemented as soon as possible.

Leung et al., (2017) mentioned that at 9 weeks of life, the infant posture appears to have an effect on early head orientation development and asymmetrical head shape. The association between supine sleeping time (in one sleep) and total supine time (over 24 hours) and the development of Plagiocephaly backs up the advice to avoid sleeping for long amounts of time throughout the day. Parents were aware of asymmetrical heads and handled their infants during awake and asleep as well as seeking medical advice from a primary care physician for prompt treatment. As regard, distribution of the studied mothers' about reported practice of NSP prevention, the current study showed that generally, the percentages of mothers completely done practices increased in the post test and follow up compared to the pre conservative nursing intervention with no statistically significant differences related all items in the table except one. There was statistically significant differences in mother's reported practices between the pre and the post conservative nursing intervention as well as between the pre and the follow up 3 months after the conservative nursing intervention related item of assessment of head shape. P1 and P2 =0.000. This could be attributed to the impact of conservative nursing intervention on reported mother practices on NSP prevention and avoidance of head postural preference in new-borns during the first few weeks of life.

This was in accordance with, **Mawji et al., (2014)** who recommended that postpartum nurses might reinforce preventative information and show measures in the home setting. Therefore, **Lennartsson, (2020)** clarified that mothers' skills improved when guidance sessions were implemented and helped to reduce the strain on the infant's malleable occiput. In this regard, **Lennartsson & Nordin, (2019)** advocated for examining the back of an infant's head shape on a frequent basis, as well as viewing the head from above and looking down from a bird's eye view to determine if the head is flattening in the middle, one-sided flattening, or ear misalignment. Therefore, adoption of an educational program has been linked to a better outcome in terms of improving NSP prevention measures.

Regarding the total mean score of mothers' knowledge and reported practice about NSP pre, post & follow-up the conservative nursing intervention, There were considerable improvements in mean ± SD in knowledge and practice scores after the follow-up test, with highly statistically significant differences. This could be because mothers are still being educated about specific reversal suggestions. This was in agreement with **Pastor-Pons et al., (2021),** who stated that caregiver education increased knowledge and abilities, resulting in parental satisfaction.

According to **Hewitt et al., (2020)** the length of time an infant spends in a prone position while awake has been linked to increased motor development. Therapists should be mindful of the possibility of motor delay while evaluating new-borns in the prone position. Parents must also be educated about the need of supervised prone playtime in the development of early motor skills. The present study displayed that there were significantly differences in motor development (prone, supine, and sit in the post-test and follow-up compared to the pre-test). Also, the motor behavior of infants was normal for all the infants on pre, post, and follow-up test (above the 16^{th} percentile). This could be due to the fact that conservative nursing intervention was vital in NSP prevention as well as raising mothers' knowledge about the importance of changing positions or promoting activities such as tummy time and using a pillow, which are important physical exercises that can help prevent cranial deformity and improve motor development. **Graham et al., (2019)** stated that new-borns with Plagiocephaly had lower-than-average cognitive and motor development in domains like gross motor and fine motor. However **Hussein et al., (2018)** stated there was no significant difference between the severity of Plagiocephaly and the degree of developmental delay.

Concerning the growth in Head Circumference measurements, the present study results demonstrated that the majority of infants' head circumference measurements was normal between 3^{rd} and 97^{th} percentile at 2,4,6 months. Therefore, establishing routine monitoring of head growth in infants is very important for detecting any potential neurodevelopmental disorders in infants. This was corresponding with **Jauhari et al., (2011)** who recommended health screening for head to evaluate the potential neurodevelopmental disorders in infants. Therefore, **Glynn, (2018)** clarified that head circumference is a good proxy for linear growth and a

much more reliable measurement than height or length for infants under the age of 2 years,

Conclusion

Based on the findings, conservative nursing interventions had highly statistically significant effect on improving mothers' knowledge and reported practices regarding prevention of Non-synostotic Plagiocephaly consequently on their infants' motor development. Motor behavior was normal for all the infants on post, & follow-up the conservative nursing intervention as indicated by their scores which plotted above the 16th percentile

Recommendations

Based on the findings of the study, the following recommendations are

- Awareness educational program should be applied on a regular base to develop the knowledge and practice of parents about the prevention of Non-synostotic Plagiocephaly among their infants.
- Endorse Argenta's Plagiocephaly Assessment Tool as a teaching tool for paediatric nurses and mothers in order to predict non-synostotic Plagiocephaly in infants.
- Repeat the study on a larger sample in different settings for generalizing the results.

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Reference

- **Argenta, L., David, L & Thompson, J. (2004):** Clinical classification of positional plagiocephaly. J Craniofac Surg.15 (3):368-72. PubMed
- **American Academy of Pediatrics. (2017):** Reduce the risk of SIDS and suffocation 2017. Retrieved from https: //www. Healthy children. org/ English/ages-stages/ baby/ sleep/ Pages/ Preventing-SIDS.aspx)
- **Ballardini, E., Sisti, M., Basaglia, N., Benedetto, M., Baldan, A., Borgna-Pignatti, C, & Garani, G. (2018).** Prevalence and characteristics of positional Plagiocephaly in healthy full-term infants at 8–12 weeks of life. Eur. J. Nucl. Med. Mol. Imaging 2018, 177, 1547–1554. [CrossRef] [PubMed]
- **Burmeister, S., Kayne, A., Hagstrom, N & Burmeister, D. (2021):** Plagiocephaly Perception and Prevention: A Need to Intervene Early to Educate Parents. Journal of Occupational Therapy. Volume 9 issues 3: Summer 2021.
- **Cevik, S & Isik, S. (2020):** The role of age on helmet therapy in deformational plagiocephaly and asymmetric brachycephaly. Childs Nervous System.;36(4):803-810.
- **Charalambous, L., Algra, M., Yamasak, E & Lampropoulou, S. (2021):** Comorbidities of deformational Plagiocephaly in infancy: a scoping review protocol. BMJ Paediatrics. Retreived from https: //www. ncbi. nlm. nih.gov /pmc/ articles/PMC8174490/pdf/bmjpo-2021-001113.pdf
- **Collett, B., Wallace, E., Kartin, D., Cunningham, M., & Speltz, M. (2019):** Cognitive outcomes and positional plagiocephaly. Pediatrics, 143(2), e20182373. https://doi.org/10.1542/peds.2018-2373
- **De Bock, F., Braun, V & Renz-Polster, H. (2017):** Deformational Plagiocephaly in normal infants: A systematic review of causes and hypotheses. Arch. Dis. Child. 2017, 102, 535–542. [CrossRef]
- **Dias, C., Figueiredo, B., Rocha, M & Field, T. (2018):** Reference values and changes in infant sleep–wake behaviour during the first 12 months of life: A systematic review. Journal of Sleep Research, 27, 1-23. doi: 10.1111/jsr.12654.
- **Ellwood, J., Rodi, J & Cranes, D. (2020):** The effectiveness and safety of conservative interventions for positional Plagiocephaly and congenital muscular torticollis: a synthesis of systematic reviews and guidance. In Ellwood et al. Chiropractic & Manual Therapies (2020). Retrieved from https: //www. ncbi. nlm. nih. gov/ pmc/ articles/ PMC7288527/ pdf/ 12998_ 2020_Article_321.pdf
- **Fenton, R & Gaetani, SA. (2019):** A pediatric epidemic Deformational Plagiocephaly/ brachycephaly and congenital muscular torticollis. Contemporary Pediatrics.;36 (2):10-18.
- **Fontana, S., Daniels, D., Greaves, T., Nazir, N., Searl, J & Andrews, B. (2016):** Assessment of deformational Plagiocephaly severity and neonatal developmental delay. Journal of Craniofacial Surgery, 27(8), 1934–1936.
- **Graham, T., Adams-Huet, B., Gilbert, N., Witthoff, K., Gregory, T & Walsh, M. (2019):** Effects of initial age and severityon cranial remolding orthotic treatment for infants with deformational Plagiocephaly. J. Clin. Med.2019,8,1097.
- **Glynn, M. (2018):** Children and adolescents. Retrieved from https: //www.sciencedirect. com/topics/ psychology/ head-circumference
- **Hewitt, L., Kerr, E., Stanley, R & Okely, A. (2020):** Tummy time and infant health outcomes: a systematic review. Pediatrics. 145:e20192168. doi: 10.1542/peds.2019-2168
- **Hocenberry, M., Wilson, D & Rodgers, C. (2017):** Wong's Essentials of Pediatric Nursing - E-Book. 10th ed. United States of America. Elsevier

- **Hussein, M., Woo, T.,Yun, I., Park, H & Kim, Y. (2018):** Analysis of the correlation between deformational Plagiocephaly and neurodevelopment delay. J. Plast. Reconstr. Aesthet. Surg.2018,71, 112–117
- **Isezuo, K., Adamu, A., Jiya, F., Ibitoye, P., Ugege, M., & UM, S. (2017):** Infant Sleep Practices and Knowledge of Sudden Infant Death Syndrome among Mothers of Infants Attending the Paediatric Clinics of a Tertiary Hospital in Sokoto, Nigeria. Journal of Scientific Research and Reports, 16, 1.
- **Jauhari P., Boggula R., & Bhave A., (2011):** Aetiology of intellectual disability in paediatric outpatients in Northern India, Dev Med Child Neurol, 2011, vol. 53 (pg. 167-172. Google Scholar.PubMed
- **Lawrence, M., Berger, L & Font, S. (2015):** The Role of the Family and Family-Centered Programs and Policies. Future Child. Spring; 25(1): 155–176. Retrieved from https:// www. ncbi. nlm. nih. gov/ pmc/ articles/PMC6342196/
- **Lennartsson, F & Nordin, P. (2019):** Nonsynostotic plagiocephaly: a child health care intervention in Skaraborg, Sweden BMC Pediatrics ,19:48 https://doi.org/10.1186/s12887-019-1405-y
- **Lennartsson, F. (2020):** Nonsynostotic Plagiocephaly: Prevention Strategies in Child Health Care. Journal of Clinical Medicine. J Clin Med. 2020 Dec; 9(12): 3946. Published online 2020 Dec 5. doi: 10.3390/jcm9123946. Retrieved at https:// www. ncbi. nlm. nih.gov/pmc/articles/PMC7762044/
- **Leung, A., MandrusiaK, A., Watter, P., Gavranich, J & Johnston, M. (2017):** Impact of Parent Practices of Infant Positioning on Head Orientation Profile and Development of Positional Plagiocephaly in Healthy Term Infants physical & occupational therapy in pediatrics http://dx.doi.org/
- **Lissauer, T. (2015):** Physical examination of the newborn. In Neonatal–Perinatal Medicine: Diseases of the Fetus and Infant, 9th ed., Martin RJ, Fanaroff AA, and Walsh MC, eds. Philadelphia, PA: Elsevier Saunders, 391–406
- **Marrugat, J. (2012):** Sample size and power calculator. Available online: https: //www. imim. es/ ofertadeserveis/ software- public/granmo/ (accessed on 1 October 2021).
- **Martiniuk A., Dunn, V., Park, M, & Lucas, B. (2017):** Plagiocephaly and Developmental Delay: A Systematic Review. J Dev Behav Pediatr 38:67–78.
- **Mawji, A., Robinson, A., Vollman, T., Fung, J., Hatfield, D & Mcneil, R. (2014):** Risk factors for positional plagiocephaly and appropriate time frames for prevention messaging. Paediatr Child Health 2014; 19(8):423-427.
- **Noritz, G & Murphy, N. (2013):** Neuromotor Screening Expert Panel Motor delays: early identification and evaluation. Pediatrics. 2013; 131(6):e2016–27. [PubMed] [Google Scholar]
- **Pastor-Pons, I., Lucha-Lopez, M., Barrau-Lalmolda, M., Rodes-Pastor, I., Rodríguez-Fernáandez, A., Hidalgo-García, C & Tricas-Moreno, J. (2021):** Efficacy of pediatric integrative manual therapy in positional Plagiocephaly: a randomized controlled trial. Pastor-Pons et al. Italian Journal of Pediatrics.
- **Piper, M & Darrah, J. (1994):** Motor assessment of the Developing Infant. 1st ed. Philadelphia, PA: W.B. Saunders Company.
- **Ryall, J., Xue, Y., Turner, K. D., Nguyen, P., & Greives, M. (2021):** Assessing the quality of life in infants with deformational plagiocephaly. Journal of Cranio-Maxillo-Facial Surgery, 49(1), 29–33.
- **World Health Organization (2014):** WHO Growth Chart http:// www.cdc. gov/ growth charts/ who_charts. htm
- **Wu, Y., Wu, Z., Zhang, Y., Zhao, C., Yu, M, Yang, W., Chen, Z & Ming Pan, Q. (2017):** Efficacy of sleep position correction for treating infants with positional Plagiocephaly. Chinese J Contemp Pediatr; 19:688–92.