

Effect of Continuous Care Model on Mothers' Knowledge, Satisfaction and the Outcomes of their Children Undergoing Congenital Club-Foot Surgery

Roquia Afify Abd El Fadel Afify¹, Faten Shafik Mahmoud² and Amal Gharib Sabaq³

(1) Assistant Lecturer of Pediatric Nursing, Faculty of Nursing, Benha University and (2,3) Professor of Pediatric Nursing, Faculty of Nursing, Benha University

Abstract

Background: Congenital clubfoot has a significant impact on the physical performance and life of the affected child and leads to reduced quality of life of the child. One of the ways to improve quality of life is to use the continuous care model. **Aim of the study** was to assess the effect of continuous care model on mothers' knowledge, satisfaction and the outcomes of their children undergoing congenital club foot surgery. **Method:** A quasi-experimental design was utilized to conduct this study. **Setting:** The study was conducted in the out patient and inpatient orthopedic pediatric departments at Benha University Hospital and Benha Specialized Pediatric Hospital. **Subject:** A purposive sample of 50 children accompanied their mothers. **Tools:** Three tools were used to collect data: tool I Structured interview questionnaire sheet, tool II Pediatric Mothers' Satisfaction Questionnaire, tools III Children outcomes including Child Health Questionnaire & Post Operative Complications Sheet. **Results:** The vast majority of studied mothers have adequate knowledge & high satisfaction after one month of implementation of continuous care model. Meanwhile, the vast majority of the studied children have good quality of life after one month of implementation of continuous care model and all of them don't have infection and hematoma after three months of implementation of continuous care model. **Conclusion:** The Continuous Care Model had a significant positive effect in improving mothers' knowledge, satisfaction and outcomes of their children undergoing clubfoot surgery. **Recommendations:** The continuous care model should be integrated as a nursing intervention for children undergoing clubfoot surgery.

Keywords: Children Outcomes, Clubfoot Surgery, Continuous Care Model, Mothers' Knowledge, Satisfaction

Introduction

Clubfoot is the most common congenital musculoskeletal defect. The incidence is 1 or 2 cases per 1000 children born. It is approximately three times more frequent in males than in females. Clubfoot is presented unilaterally or bilaterally in 50% of cases (López-Carrero et al., 2023).

The symptoms are visible in both congenital and acquired clubfoot conditions. The child walks on the outside edge of the foot or, in extreme circumstances, on the back of the foot (to the greatest extent feasible). One or both feet may be affected. The

clubfoot typically has four characteristics: bony malformations (mostly affecting the heel bone), joint misalignments or dislocations (the ankle is frequently affected), weakened or shortened muscles (for example, the calf muscles), and limitations in the capsule-ligament apparatus (when tendons or ligaments are short or damaged) (Qureshi et al., 2022).

Clubfoot or talipes equinovarus (TEV) can be either an isolated deformity (idiopathic), or associated with syndromes (Akinyoola et al., 2023). Its etiology may be associated with myelodysplasia,

arthrogryposis or multiple congenital deformities, but the most common presentation is in isolation, which is considered the idiopathic type due to their unknown cause. However, around 20% of cases are associated with underlying diseases, classified as “teratological (Oliveira et al., 2023).

Prenatal diagnosis is possible with an ultrasound routine check at around 20 weeks, which can recognize the different forms of clubfoot. For isolated clubfoot, prenatal ultrasonography has an accuracy of 86% and typically shows a higher Pirani score, indicating postnatal severity. Prenatal diagnosis can assist and psychologically ready parents for the condition and its management (Dibello et al., 2022).

Following the failure of conservative methods, surgical repair can be used to achieve full correction of the clubfoot deformity. With numerous surgical treatments, it is difficult to attain plantigrade feet with a pain-free gait. As a result, selecting the appropriate initial surgical method is essential for achieving excellent long-term outcomes (Abdou Mar’ei et al., 2022).

Management of clubfoot should be started just after birth and should be nonsurgical. The Ponseti process is based on casting, then serial manipulations, and then, if required, surgery. Management is given right away, after the child is born. On a weekly basis, the ligaments and tendons of the foot are stretched and manipulated, accompanied by the application of a soft-fiber glass cast that aids in the restoration of the ligament to its natural position. Surgical correction is typically postponed until the infant is between the ages of six and nine months. Surgery is used to correct the clubbed foot and align it in its actual position (Pandey et al., 2021).

The Continuous Care Model (CCM) is one of the caring models designed to provide a plan for accepting and enhancing the patient’s insight and function for continuous care and control of the disease and possible complications by training in the skills needed by patients after discharge. CCM focuses on the influential and balanced role of the nurse, the children and the children’s family through a systematic approach and provides an effective, interactive and consistent communication between the client and the healthcare providers (Borji et al., 2016).

Nurses have an important role in the prevention of cast complications since they are the ones who identify the indicators of cast complications early on and take the necessary precautions (Ibrahim & Abd Elkhair, 2023).

Mothers are essential to the treatment of CTEV since the affected children frequently require physiotherapy, recurrent surgeries, and long-term usage of orthopaedic braces, all of which require a high level of adherence to treatment and follow-up. The awareness, knowledge, and habits of these mothers on the disease under consideration are closely linked to their compliance. The caretakers undergo extreme mental stress and seek advice from various sources, including medical professionals, family members, and traditional healers, in order to cure their children (Iqbal et al., 2021).

Significance of the study:

Congenital clubfoot is the seventh most prevalent congenital birth anomaly and the most common forms of the musculoskeletal system (WHO, 2020). Clubfoot, also known as congenital talipes equinovarus, is one of the common congenital conditions that causes mobility impairment in children. It is a relatively common pediatric orthopedic disorder (Tabard-Fougère et al., 2024).

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The global pooled prevalence of clubfoot was found to be 1.18 per 1000 live births (95% CI: 1.00–1.36), with a range of 0.9–1.8 cases per 1000 live births in different world regions. Globally 176,476 children will be born with clubfoot each year. The highest prevalence rates were observed in low- and middle-income countries, particularly in the South-East Asia Region (1.80, 95% CI: 1.32–2.28) and the Africa Region (1.31, 95% CI: 0.86–1.77) (Smythe et al., 2023).

Furthermore, the overall number of children who admitted "from 2020 to 2021" to the orthopedic pediatric surgery department in Benha University Hospital & Benha Specialized Pediatric Hospital hospitals were 410 and 34.9 percent (75) of those children had congenital clubfoot surgery (Statistical affairs department in Benha University Hospital & Benha Specialized Pediatric Hospital, 2021).

Congenital clubfoot has a negative impact on children's lives; if left untreated, it can lead to dependency on others for everyday activities, ambulation difficulties, and lifelong impairment. It has a significant financial impact not just on the family but also on the country (Murtaza et al., 2020). In Egypt, especially in Benha city, there is no study conducted to evaluate the effect of implementing continuous care model on mothers and children outcomes children undergoing congenital club foot surgery. So the researcher found urgent to conduct this study to improve quality of life, decrease the post operative complications and increase mothers' satisfaction.

Aim of the Study:

This study was aimed to assess the effect of continuous care model on mothers' knowledge, satisfaction and the outcomes of

their children undergoing congenital club foot surgery.

Research Hypotheses:

H1 - Mothers of children with congenital club foot who will receive the education based on continuous care model will exhibit higher knowledge scores than before.

H2 - Mothers of children with congenital club foot who will receive the education based on continuous care model will exhibit higher satisfaction scores than before.

H3 - Children with congenital club foot who will receive the education based on continuous care model will exhibit significant higher quality of life scores than before.

H4 - Children with congenital club foot who will receive the education based on continuous care model will exhibit significant lower postoperative complications than before.

Subjects & Methods

Research design:

Quasi-experimental design (pre-posttest, one group) was followed to fulfill the aim of the study.

Setting:

The study was conducted in outpatient and inpatient orthopedic pediatric departments at Benha University Hospital and Benha Specialized Pediatric Hospital in Benha city.

Sampling:

The sample size was calculated using this formula developed by (Mason, 2013).

$$n = \frac{M}{[(S^2 * (M - 1)) / P(1 - P)] + 1}$$

Which:

n= Sample size M= Total population (75)

S= This depends on level of confidence, for 80% this is 1.282 P= Error level 5%

Based on the above formula, the sample size required was **50**

A purposive sample of 50 children accompanied their mothers was selected from the above mentioned setting after fulfilled the following inclusion criteria: Children from 1 to 8 year with idiopathic clubfoot, recently diagnosed with unilateral or bilateral congenital clubfoot. Mothers of children are willing to participate in the study.

Tools of data collection:

The following tools were used in this study:

Tool (I): Structured interviewing questionnaire sheet:

This tool was designed by the researchers in an Arabic language after reviewing the recent and relevant literature. It was divided into four main parts:

Part 1: Characteristics of the studied mothers which included; age, level of education, occupation, consanguinity between parents and degree of (5 items).

Part 2: Characteristics of the studied children which included; the age, gender, ranking of child in family, educational level, affected foot and sibling medical history (6 items).

Part 3: Medical data of the studied children which included; symptoms appearing on child before diagnosis, diagnostic investigation, time of starting treatment, method of treatment and previous foot surgery (5 items)

Part 4: Mother's knowledge assessment:

This tool was adapted from **Kyle & Carman, (2021); Kliegman et al., (2020); Butterworth & Marcoux, (2019); & Natrajan, (2018)**; to assess mothers' knowledge regarding club foot. It involved (26) multiple choice questions about

definition, etiology, signs & symptoms, forms, types, idiopathic clubfoot, secondary clubfoot, risk factors, investigation, complications, prevention, difficulties, methods of treatment, nonsurgical treatment, Ponsti method, French method, surgical treatment, indication for performing surgery, nursing care before, after and on discharge. Also, role of mother after surgery and, role of mother on discharge in cast care, hygiene care and range of movement.

Knowledge scoring system:

According to the answers collected from the mothers; a scoring system was applied to interpret mothers' knowledge assessment. The studied mothers' answers were checked and compared with the predesigned model answer that was given a score (1) for correct answer, while a score (0) for wrong answer or don't know.

The total mothers' knowledge scores were ranged from (0 - 26) grades which classified into two categories as the following: Inadequate knowledge: < 60% (< 16 marks) of total knowledge score. Adequate knowledge: ≥ 60% (≥ 16 marks) of total knowledge score.

Tool (II): Pediatric Mothers' Satisfaction Questionnaire:

The researchers adopted this tool from **Ygge & Arnetz, (2001)** to assess level of mothers' satisfaction regarding their children undergoing congenital club foot surgery. It was consisted of 43 questions grouped under eight domains, as information on illness (3 questions), information on routines (4 questions), accessibility (3 questions), medical treatment (4 questions), care processes (8 questions), staff attitudes (8 questions), parent participation (4 questions) and staff work environment (9 questions).

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Scoring system for mothers' satisfaction:

The mothers were asked to rate items on a 4-point rating scale: ranged from (not at all=1, not specially=2, somewhat= 3 and to a great degree=4). The total scores ranged from 43-172. Accordingly, the total level was categorized to low level of satisfaction < 60% at total score (<103), moderate level of satisfaction 60- 75% at total score (103 > 129) and high level of satisfaction ≥75% at total score (≥ 129).

Tool (III): Children Outcomes included two parts:

Part 1: Child Health Questionnaire Parent Form (CHQ PF):

The researcher adopted this tool from Landgraf et al., (1996) to evaluate quality of life for children. It is a generic form of health related quality of life questionnaire (HRQOL). This questionnaire consisted of 50 statement categorized under 13 domains including global health (1 item), physical functioning (6 items), role/social-emotional/behavioral (3 items), role/social-physical (2 items), bodily pain (2 items), behavior (6 items), mental health (5 items), self-esteem (6 items), general health perceptions (6 items), parent impact emotion (3 items), parent impact time (3 items), families activities (6 items) and family cohesion (1 item).

Scoring system of Child Health Questionnaire:

The response options of each item vary from 4–6 levels. For concepts with multiple items, the responses to the items are summed up and transformed to a scale that ranges from 0 (lowest possible score indicating the worst health) to 100 (highest possible score indicating the best health).

Scores	1	2	3	4
Response options				
Physical functioning	no, not limited	yes, limited a little	yes, limited some	yes, limited a lot
Role/social-emotional/behavioral				
Role/social-physical				
Response options	Limited a lot	Yes, limited some	Yes, limited a little	No, not limited
Parent impact time				

The score of total HRQOL was classified to: good quality of life ≥75 % at total score (≥51%), average quality of life 60 - < 75% at total score (40%< 51%) and poor quality of life < 60 % at total score (< 40%) in case of response options contains 4 levels.

Scores	1	2	3	4	5
Response options	Poor	Fair	Good	Very good	Excellent
Global health					
Family cohesion					
Behavior	Never	Almost never	Sometimes	Fairly often	Very often
	Poor	Fair	Good	Very good	Excellent
Mental health	None of the time	A little of the time	Some of the time	Most of the time	All of the time
Self-esteem	Very dissatisfied	Somewhat dissatisfied	Neither satisfied nor dissatisfied	Somewhat satisfied	Very satisfied
General health perceptions	Definitely false	Mostly false	Don't know	Mostly true	Definitely true
	Much worse now than 1 year ago	Somewhat worse now than 1 year ago	About the same now as 1 year ago	Somewhat better now than 1 year ago	Much better now than 1 year ago
Parent - impact emotion	None at all	A little bit	Some	Quite a bit	A lot
Families activities	Never	Almost never	Sometimes	Fairly often	Very often

The score of total HRQOL was classified to: good quality of life ≥75 % at total score (≥90%), average quality of life 60 - < 75% at total score (72%< 90%) and poor quality of life < 60 % at total score (< 72%) in case of response options contains 5 levels

Scores	1	2	3	4	5	6
Response options	none	very mild	Mild	moderate	severe	very severe
Bodily pain	none of time	once or twice)	a few times	fairly often	very often	almost every day

The score of total HRQOL was classified to: good quality of life $\geq 75\%$ at total score ($\geq 41\%$), average quality of life $60 < 75\%$ at total score ($32\% < 41\%$) and poor quality of life $< 60\%$ at total score ($< 32\%$) in case of response options contains 6 levels.

Part 2: Post Operative Complications Sheet:

The researchers designed this tool after reviewing related literature as **Cady et al., (2022)**; **Hegazy et al., (2019)**; & **Chotigavanichaya et al., (2016)**. It was used to assess the post operative complications regarding children undergoing congenital club foot surgery on discharge and follow up, it was included seven elements as; bleeding, infection, plaster sores and dermatitis, relapsed foot, cast loosening, vascular necrosis of foot bones, hematoma and wound dehiscence.

Scoring system of Post Operative Complications Sheet:

The scoring system of post operative complications sheet was ranged from (0- 1) grade which classified as the following: grade (0) indicated absence of complication and grade (1) indicated presence of complication.

Content validity:

Tools of data collection were investigated for their content validity by panel of three experts (two professor and one assistant professor in pediatric nursing specialty from the faculty of nursing, Benha University) to test content validity of the tools

and to judge its clarity, relevance, comprehensiveness, understanding and applicability. The opinion was elicited regarding the layout, format and sequence of the questions and all of their remarks were taken into consideration and the tools were regarded as a valid from the experts' point of view.

Reliability:

A statistician used Cronbach's alpha coefficient test in SPSS program, version 24 to examine the produced tools for dependability. The results were as the following: Internal consistency reliability Cronbach's alpha for Mother's knowledge regarding congenital club foot is good reliable emerged as (0.827), Pediatric mothers' Satisfaction Questionnaire (0.858), Child Health Questionnaire Parent Form (0.901) & Post Operative complications sheet (0.940).

Ethical Consideration:

An approval was obtained from the Scientific Research Ethical Committee at the faculty of Nursing Benha University. After explaining the study's aim, advantages, risks, and procedure, each child/participant gave his verbal oral agreement to participate. The data was kept private and anonymous, and it was only used for research purposes. Participants were informed that participation in the study was entirely optional and that they had the right to withdraw at any time without incurring any consequences.

Pilot study:

A pilot study was conducted on five children accompanied their mothers from the entire sample size who were randomly selected from the same setting to examine the clarity, feasibility, and applicability of the study tools. In the light of pilot study analysis, no modification was done, and mothers were included to total sample of the study. It tooks approximately one month from the beginning to the end of June.

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Field work:

Data collection period:

The data was collected over a 11-month period, beginning 1st of July 2022 and ending of May 2023. The researcher began by introducing herself to the participants and providing a quick overview of the study's purpose and nature. The researcher came to the study settings three days a week (Saturday in Benha University Hospital because this day is specific for performing and follow up pediatric foot and ankle surgery & Sunday and Wednesday in Benha Specialized Pediatric Hospital) from 12:00 PM to 2: 00 PM according to the beginning time of orthopedic pediatric outpatient clinic. Initial screening was carried out for all children having inclusion criteria. An oral approval obtained from each child/caregiver after explaining the aim of the study

• Study Framework:

The Study's Framework was divided into four stages as the following:

Familiarization stage:

This period took 3 months (from the beginning of July 2022 to the end of September 2022).

This stage was the first step is to establish the accurate recognition of the problem, identify needs. Each child and his mother were interviewed individually. Number of mothers and their children taken every week was ranged from 3-5 mothers. At the beginning of interview, the researcher welcomed mothers and their children, explained the purpose, duration and orienting them about continuous care model, stages, create motivation and discuss the importance of continuing care contact between the researcher and the participant of the study, explain the ways of communication and identify the required phone calls schedules

until the end of the intervention. and take their oral approval to participate in the study prior to baseline data collection.

The researcher gave the studied mothers Structured Interviewing Questionnaire (**Tool I**) in order to fill to assess mothers' & children personal data & knowledge regarding club foot. It took nearly (10-15 minutes).

Then, the researcher distributed Pediatric Mothers' Satisfaction Questionnaire (**Tool II**) (Pretest) to assess level of mothers' satisfaction regarding their children undergoing congenital club foot surgery. The average time required for completion of the questionnaire was nearly (10-15 minutes).

Also, the researcher distributed Child Health Questionnaire Parent Form (**Tool III part 1**) (Pretest) to evaluate quality of life for children undergoing congenital club foot surgery. The average time required for completion of the questionnaire was around (10-15 minutes).

Sensitization stage:

This stage consisted of the program development, instructional design (teaching methods and media) and implementation phase.

It was performed to engage the mothers in the continuous care process. Based on baseline data obtained from the familiarization stage and relevant literature reviews, the educational program was developed by the researcher as indicated by mothers' level of understanding in simple Arabic language. Different methods of teaching were used as modified lecture, demonstration, re-demonstration and group discussion. Suitable teaching media were included a hand out as well as audio-visual aids, role play, manikin and real equipment to

help proper understanding of the content by mothers.

Program development: It took one month from the beginning of October to the end of October 2022.

Theoretical sessions of the program:

a) First Session: the researcher introduce herself to the participants and introduce the content and its objectives at the beginning of this session, the researcher stated the objectives of this session. It included; brief explanation about anatomy of foot and ankle, definition of congenital clubfoot, causes, classification, forms, signs & symptoms, risk factors, investigation, complications, preventive measures and brief on methods of treatment. It took 45-60 minutes.

b) Second Session: included information about course of treatment in details including nonsurgical as: (ponsti method) & surgical methods of treatment and the indication of performing surgery when child not response to ponsti method treatment, nursing care before surgery as inform the doctor about the child's history, symptoms, examination of the child by the orthopedic surgeon to find out the degree of clubfoot, preparation for surgery as fasting for 6-8 h. Nursing care after surgery as follow up of vital signs, performing neurovascular assessment every hour for 24 hours, administer medications as planned, such as prophylactic antibiotics and adequate dose of pain reliever. It took 45-60 minutes

c) Third Session: included information about nursing care of children with clubfoot surgery on discharge as the importance of follow-up care, indication for calling pediatric orthopedic surgeon in case of intense edema, fever, change of color of foot, child unable to move their toes. The

researcher discussed complications after surgery and how to deal with it. Also illustrated healthy dietary regimen after surgery then taught mothers some exercises to perform for child after surgery. It took 45-60 minutes

d) Forth Session: included information about role of mother after surgery and on discharge included an explanation about the importance of commitment to a regular follow-up schedule and following the physician's advice. Explain nursing guidelines for the practice of cast care including; (position, handling, skin care), hygiene care (bathing and diaper care), and range of movement. It took 60 minutes.

Implementation phase

This phase took 3 months from the beginning of November 2022 to the end of January 2023.

The implementation phase was achieved through sessions, each session started by a summary of the previous session and objective of the new one. Taking into consideration the use of Arabic language that suits the studied mothers and their children' educational level. Motivation and reinforcement during sessions were used to enhance motivation for the sharing in the study. The educational sessions were given to each mother accompanied her child separately in the orthopedic/ general surgery inpatient department within 2 days before discharge for each mother and her child. The number of mothers taken ranged from 1-2 mother a day. The total number of theoretical sessions for the studied mother (4) session, each session kept going from 45-60 minutes, The sessions were started at 12:00 PM to 2:00 PM. three days a week (Saturday, Sunday and Wednesday). These sessions were repeated to each mother.

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Control stage:

This stage took one month from the beginning of February 2023 to the end of February 2023.

During this stage, mutual relationships between researchers and the studied mothers are maintained through weekly phone calls for each mother (8 calls) throughout one months, according to the mother's preferred time and readiness for making phone calls (morning or afternoon). Each mother's phone call were varied depending on a mother's needs. Issues such as child's situation after the surgery, diet, pain alleviation, bath limitations, and any arising problems were the subject of telephone calls was identified, addressed and resolved.

Evaluation stage:

This stage took 3 months from the beginning of march to the ending of May 2023. After conducting educational program mothers' and their children knowledge, satisfaction, quality of life was evaluated using **tools (I), (II) & (III part 1)** (post and after three months as follow-up). Additionally the child postoperative complications was assessed using **Tool (III part 2)** on discharge, after one month and after three months as follow-up by evaluate the effect of implemented continuous care model.

Administrative approval:

Official letters was taken from the Dean of Faculty of Nursing, Benha university contains the title, objectives, tools and the study technique was directed to the directors of the previously mentioned settings to obtain the official agreement to conduct study.

Statistical analysis:

The statistical analysis of data was done by using the computer software of Microsoft Excel Program and Statistical Package for

Social Science (SPSS) version 24. Data were presented using descriptive statistics in the form of frequencies and percentage for categorical data, the arithmetic mean (\bar{X}) and standard deviation (SD) for quantitative data. Qualitative variables were compared using chi square test (χ^2). In addition, r- test were used to identify the correlation between the study variables.

Degrees of significance of results were considered as follows:

- P-value > 0.05 Not significant (NS)
- P-value < 0.05 Significant (S)
- P-value \leq 0.001 Highly Significant (HS).

Results:

Table (1): Shows that, less than half of the studied mothers (46.0%) are in the age group 25 -< 30 years with mean age is 27.52 ± 5.67 years, half of them (50.0%) have secondary education. As regards occupation, more than two thirds of them (70.0%) are working. Also, more than half of the studied mothers (52.0%) have positive consanguinity and more than half of them (61.5%) who have positive consanguinity are first degree.

Table (2): Illustrates that, more than half of the studied children (56.0%) are in the age group 1 -< 3 years with mean age is 3.18 ± 1.07 years, the majority of them (86.0%) are male. Also, more than half of them (60.0% & 60.0% respectively) have first ranking between their siblings and KG education. Moreover, more than two-thirds of them (68.0%) have bilateral clubfoot and more than three quarter of them (78.0%) don't have medical history of their siblings regarding clubfoot.

Table (3): Demonstrates that, two-thirds of the studied children (66.0%) have torsion of the upper part of the foot downward and inward. Moreover, all of them (100.0%) are examined by the doctor. The majority of them

(88.0%) are started treatment for less than a year and treated by Ponseti method by stretching and splinting the affected part respectively. Moreover, more than one quarter of them (28.0%) have history of foot surgery and all of them (100.0%) undergoing tenotomy surgery.

Figure (1): Shows that, the majority of studied mothers (88.0%) have inadequate knowledge level regarding club foot at pre-implementation phase of continuous care model. Meanwhile, the vast majority (90.0%) have adequate knowledge level at post-implementation phase and the majority (84.0%) at follow-up implementation phase of continuous care model.

Figure (2): Shows that, the vast majority of the studied mothers (96.0%) have low level of total satisfaction regarding their children undergoing club foot surgery at pre-implementation of continuous care model. Meanwhile, (96.0% and 90.0%) of them respectively, have high level of total satisfaction at post and follow-up implementation of continuous care model.

Figure (3): Shows that, the vast majority (96.0%) of the studied children have poor quality of life at pre-implementation of continuous care model. Meanwhile, (94.0% and 88.0%) of them have good quality of life at post and follow-up implementation of continuous care model respectively.

Table (4): Shows that, one fifth of the studied children (20.0%) have infection and hematoma on discharge. Meanwhile, the minority (12.0% and 8.0%) have infection and hematoma after one month and all of them (100.0%) don't have infection and hematoma after three months of implementation of continuous care model. Also, there is a statistical significant difference in post-operative complications on discharge and

follow up after implementation of continuous care model ($P < 0.001$).

Table (5): Clarifies that, there is significant statistical positive correlation between total knowledge level, total satisfaction score of the studied mothers at pre ($r=0.358$, $p= 0.007^{**}$), post ($r=0.459$, $p =0.001^{**}$) & follow-up implementation of continuous care model ($r=0.400$ and $p =0.004^{**}$). While, there is significant statistical positive correlation between total knowledge levels total children's quality of life score of the studied mothers at pre ($r=0.743$, $p = 0.000^{**}$) post ($r=0.359$, $p=0.007^{**}$) & follow-up implementation of continuous care model ($r=0.421$, $p =0.000^{**}$). Additionally, there is significant statistical positive correlation between total children's quality of life score & total satisfaction score of them at pre ($r=0.828$, $p= 0.000^{**}$) post ($r=0.595$, $p=0.000^{**}$) & follow-up implementation of continuous care model ($r=0.575$, $p=0.000^{**}$).

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Table (1): Distribution of the studied mothers regarding their characteristics(n=50).

Characteristics of the studied mothers	No.	%
Age (years)		
20 -< 25	13	26.0
25 -< 30	23	46.0
30 -< 35	6	12.0
≥ 35	8	16.0
Mean ± SD		(27.52± 5.67)
Educational level		
Illiterate	3	6.0
Read and write	4	8.0
Primary education	7	14.0
Preparatory education	8	16.0
Secondary education	25	50.0
High education	3	6.0
Occupation		
Working	35	70.0
Don't work	15	30.0
Consanguinity		
Yes	26	52.0
No	24	48.0
If yes, what is the degree of consanguinity? (n=26)		
First degree	16	61.5
Second degree	7	26.9
Third degree	3	11.6

Table (2): Distribution of the studied children according to their characteristics(n=50).

Characteristics of the studied children	No.	%
Age (years)		
1 -< 3	28	56.0
3 -< 5	13	26.0
5 - 8	9	18.0
Mean ± SD		(3.18 ± 1.07)
Gender		
Male	43	86.0
Female	7	14.0
Child ranking		
First	30	60.0
Second	13	26.0
Third and more	7	14.0
Educational level		
KG education	30	60.0
Preschool	17	34.0
Primary school	3	6.0
Affected foot		
Right foot	7	14.0
Left foot	9	18.0
Bilateral foot	34	68.0
Medical history of the siblings		
Yes	11	22.0
No	39	78.0

Table (3): Distribution of the studied children regarding their medical data (n=50).

Medical data of the studied children	No.	%
The symptoms that appeared on the child before the diagnosis		
Torsion of the upper part of the foot downward and inward	33	66.0
The heel rotates inward.	11	22.0
The affected leg or foot is slightly shorter than the other	0	0.0
The calf muscles of the affected leg are underdeveloped	6	12.0
No pain	0	0.0
*The investigations that conducted for the child		
MRI	3	6.0
Examination of the child by the doctor	50	100.0
X ray	22	44.0
Ultrasound	14	28.0
Nerve examination	0	0.0
Time of starting treatment for child		
< 1 year	44	88.0
1-5 years	6	12.0
> 5 years	0	0.0
Method of treatment was used for the child before the surgery		
Ponseti method by stretching and splinting the affected part	44	88.0
French method by massage	6	12.0
History of foot surgery		
Yes	14	28.0
No	36	72.0
If yes, what was the surgery? (n=14)		
Tenotomy	14	100.0

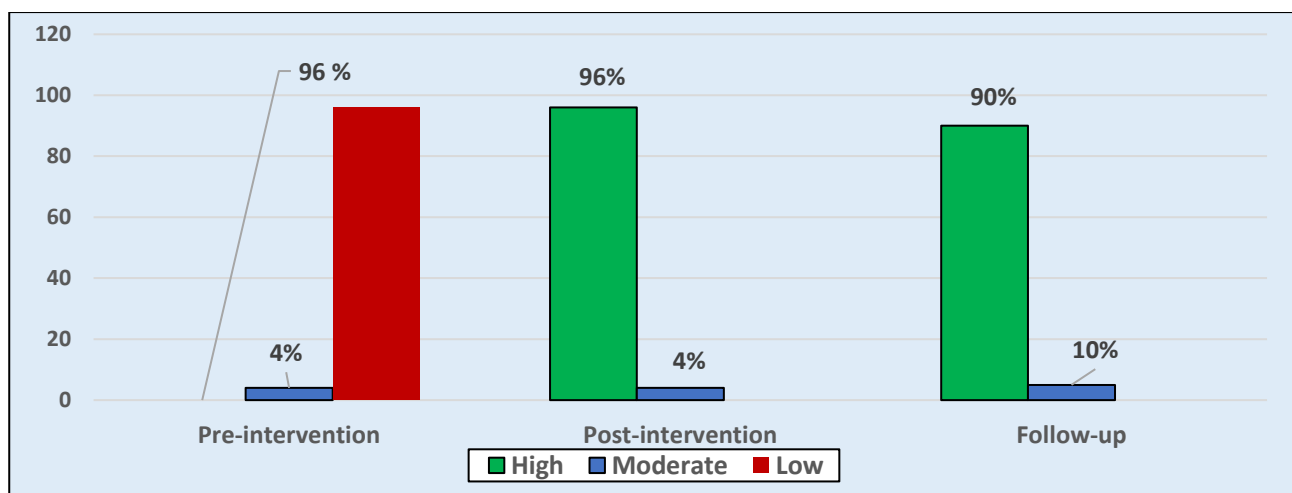


Figure (1): Distribution of the studied mothers' regarding their total knowledge level about club foot at pre, post and follow-up implementation of continuous care model (n=50).

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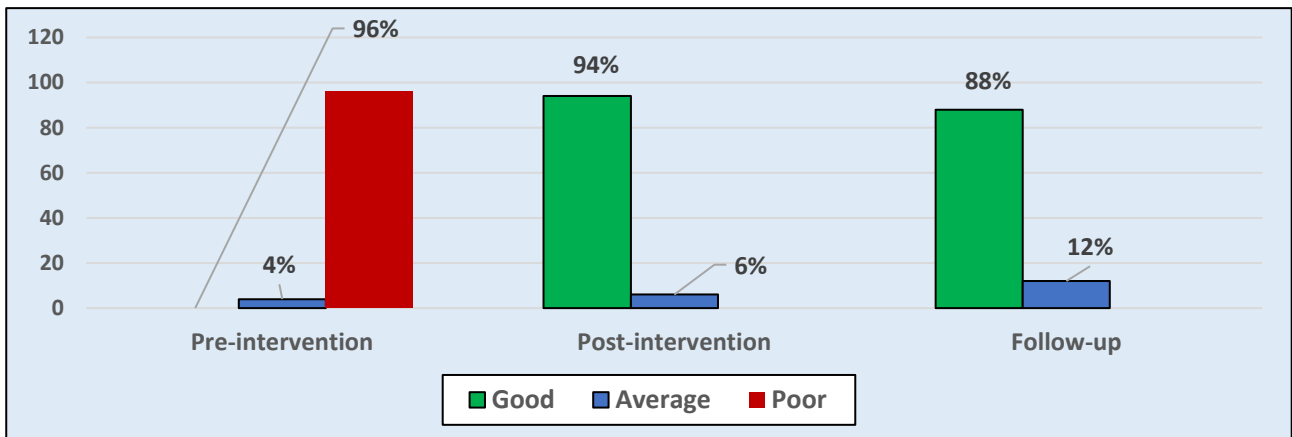


Figure (2): Distribution of the studied mothers' total satisfaction regarding their children undergoing club foot surgery at pre, post and follow-up implementation of continuous care model (n=50).

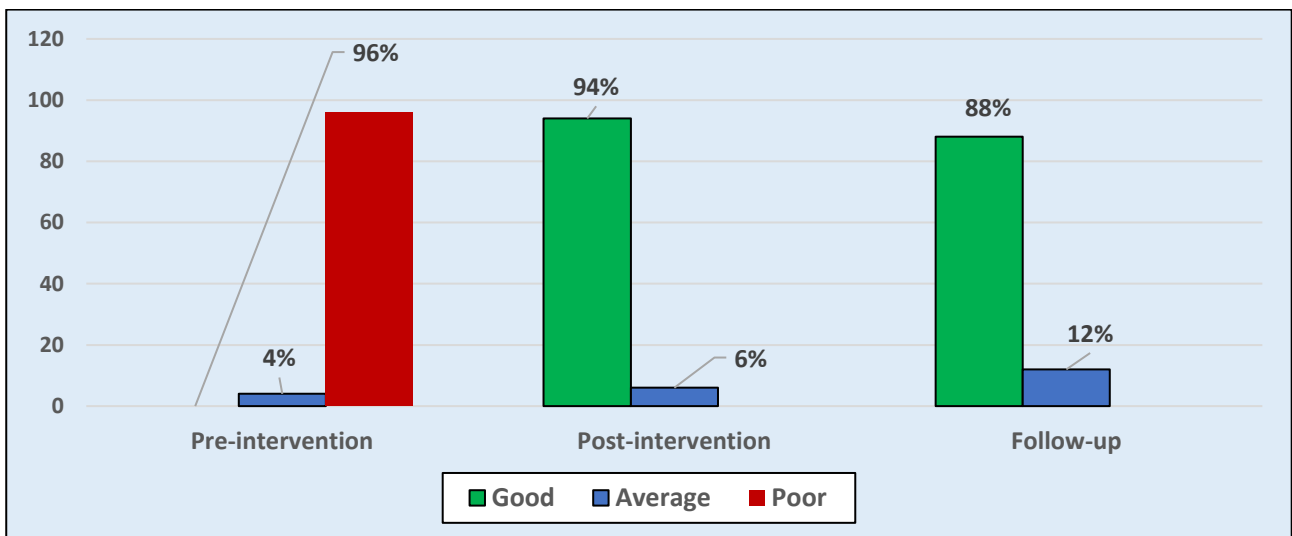


Figure (3): Distribution of the studied children's quality of life regarding club foot surgery at pre, post and follow-up implementation of continuous care model (n=50).

Table (4): Distribution of the studied children regarding post-operative complications on discharge and follow up phases after implementation of continuous care model (n=50).

Items	On discharge				After one month				After three months				X2 (p ₁)	X2 (p ₂)	X2 (p ₃)	X2 (p ₄)
	Yes		No		Yes		No		Yes		No					
	No.	%	No.	%	No.	%	No.	%	No.	%	No.	%				
Bleeding	7	14.0	43	86.0	4	8.0	46	92.0	0	0.0	50	100.0	X²=0.525 P=0.262^{NS}	X²=10.96 P=0.005**	X²=4.167 p=0.041*	X²=7.260 P=0.027*
Infection	10	20.0	40	80.0	6	12.0	44	88.0	0	0.0	50	100.0	X²=5.190 P=0.045*	X²=12.31 P=0.000**	X²=6.383 p=0.012*	X²=4.460 P=0.048*
Plaster sores and dermatitis	0	0.0	50	100.0	3	6.0	47	94.0	6	12.0	44	88.0	X²=3.093 P=0.079^{NS}	X²=6.201 P=0.035*	X²=1.099 p=0.295^{NS}	X²=6.383 P=0.041*
Cast loosening	0	0.0	50	100.0	7	14.0	43	86.0	11	22.0	39	78.0	X²=7.527 P=0.006**	X²=11.20 P=0.000**	X²=1.084 p=0.298^{NS}	X²=11.742 P=0.003*
Hematoma	10	20.0	40	80.0	4	8.0	46	92.0	0	0.0	50	100.0	X²=5.990 P=0.037*	X²=12.31 P=0.000**	X²=4.167 p=0.041*	X²=7.276 P=0.026*
Wound dehiscence	7	14.0	43	86.0	3	6.0	47	94.0	0	0.0	50	100.0	X²=1.778 P=0.182^{NS}	X²=10.96 P=0.005**	X²=3.093 p=0.079^{NS}	X²=7.929 P=0.019*
Relapsed foot	0	0.0	50	100.0	0	0.0	50	100.0	5	10.0	45	90.0	X²=0.000 P=1.000^{NS}	X²=6.000 P=0.039*	X²=7.501 P=0.001**	X²=6.001 P=0.022*

X²: Chi-square test. P= p-value NS No significant at p >0.05. * Significant at p < 0.05. **Highly significant at p < 0.001.

P₁: p value for comparing between **on discharge and after one month.**

P₂: p value for comparing between the in **on discharge and after three months.**

P₃: p value for comparing between the in **after one month and after three months.**

P₄: p value for comparing between the **three times.**

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Table (5): Correlation between total mothers' knowledge score, total satisfaction score and total children's quality of life score at pre, post and follow-up implementation of continuous care model(n=50).

	Total mothers' knowledge score						Total children's quality of life score					
	Pre implementation of CCM		Post implementation of CCM		Follow-up implementation of CCM		Pre implementation of CCM		Post implementation of CCM		Follow-up implementation of CCM	
	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value	r	p-value
Total mothers' satisfaction score	0.358	0.007*	0.459	0.001**	0.400	0.004*	0.828	0.000*	0.595	0.000**	0.575	0.000**
Total children's quality of life score	0.743	0.000*	0.359	0.007**	0.421	0.000*						

r= correlation coefficient test. P= p-value **Correlation is significant at the 0.05 level (2-tailed).

Discussion:

Clubfoot is a complex musculoskeletal deformity of the foot requiring consistent efforts of the surgeon as well as parents for its correction (**Saini et al., 2023**). Club foot can lead to lifelong disability. The child affected may not be able to wear shoes, may experience pain when walking, may have low self-esteem, may not be able to perform basic tasks such as carrying water, collecting food and going to school. These factors may affect the health of an individual (**Muinde, 2021**). The improvement of a child's health related quality of life is the ultimate goal of treatment for children with orthopedic issues. Options for treatment depend on the child's age (**Ibrahim & Abd Elkhair, 2023**).

One of the ways that nurses could continue their care and education even after the discharge of the child from hospital is to use the continuous care model (CCM). Using this model, nurses would be able to care for both the child and their family (**Panahi et al., 2022**).

Regarding characteristics of studied mothers the finding of present study showed that, less than half of the studied mothers were in the age group 25 -< 30 years with mean age (27.52 ± 5.67) years old, half of the studied mothers had secondary education & more than two thirds of them were working. Maternal characteristics found to be significantly associated with increased risk of clubfoot were young maternal age at conception and low maternal education (**Dim et al., 2022**).

Consanguinity increases the prevalence of rare genetic congenital anomalies and nearly doubles the risk for neonatal and childhood death, intellectual disability and other anomalies. Thus, clubfoot is a heterogeneous disorder with polygenetic inheritance (**Dim et al., 2022**). This finding

matches with the present study which showed that, more than half of the studied mothers have positive consanguinity with the father. This finding in the same line with **Abdallah & Nassar, (2022)** who conduct study about "Outcome of prenatal diagnosis of clubfoot" and found that more than three quarters of them have positive consanguinity.

Regarding characteristics of the studied children the present study revealed that, more than half of the studied children are in the age group 1 -< 3 years with mean age (3.18 ± 1.07) years old. This finding agree with **Ugorji, et al., (2020)** who conduct study in South- East Nigeria about "Epidemiology and Pattern of Clubfoot in Enugu" and found that more than half of the children were are in the age group 1 -< 3 years.

Male gender are around twice as likely as females to develop idiopathic clubfoot (**Gurnett et al., 2023**). This parallel with the present study finding which indicated that, the majority of the studied children were male. This finding consistent with **Udemezue et al., (2023)** who suggested that females require a greater number of predisposing factors than males to produce a clubfoot deformity and added that, gender differences play a role in increasing incidence rate in male than female.

Congenital clubfoot was more common in first born children than other ranking (**Ruzzini et al., 2023**). This consistent with the present study finding which indicated that, less than two thirds of the studied children were first ranking. This finding parallel with **Saini et al., (2023)** who conduct study about "a prospective study on functional outcomes of serial cast correction in congenital talipes equinovarus (CTEV) by ponseti method" and found that more than two thirds of the studied children were of first born.

A bilateral presentation of clubfoot occurs in 50% of cases, while in the case of unilateral disease, the right foot is the most

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affected (**Ruzzini et al., 2023**). This agrees with the present study finding that revealed that, more than two-thirds of the studied children had bilateral clubfoot. This finding congruent with **Rudraprasad et al., (2020)** who conduct study in India about “analysis of clubfoot clinic at a pediatric tertiary care government hospital in Karnataka” and found that more than half of the studied children had bilateral clubfoot.

Concerning medical history of other siblings have clubfoot, the present study finding showed that, more than three quarter of the studied children had no siblings history. This may be due to less than two thirds of studied children were first ranking and there is a 10% chance of a subsequent child being affected if the parents already have a child with a clubfoot (**Dim et al., 2022**). This finding matches with **Almogbil et al., (2021)** who conduct study about “The level of public awareness about clubfoot in the al-qassim region and importance of early childhood intervention: a cross-sectional study” and found that majority of the studied children had no medical history of the siblings.

On assessing the investigations that done for the children, the present study showed that, all of the studied children were examined by the doctor after birth. This finding agree with **Kardm et al., (2022)** who conduct study in Saudi Arabia about “what does Aseer region community know about club foot, its related risk factors, and management options?” and reported that less than half of them were examined by the doctor and diagnosed immediately after birth.

Regarding time of starting treatment for children with clubfoot, the present study revealed that, the majority of the studied children started treatment less than one year. This may be due to this time is the best to start treatment to get better outcomes. This

finding congruent with **Sadiq et al., (2023)** who conduct study about “Assessing Public Awareness of the Knowledge and Clubfoot about the Importance of the Treatment of Early Childhood” and found that the more than three quarters of the studied children started treatment less than one year.

According the method used for children with club foot before the surgery, the present study finding revealed that, the majority of the studied children were treated by Ponseti method by stretching and splinting the affected part. This due to Ponseti method is the gold standard for treating clubfoot and can be initiated soon after birth and early medical intervention improves the outcome of clubfoot (**López-Carretero et al., 2023**). This finding in accordance with **Kardm et al., (2022)** who found that less than two fifth of the studied children were treated by Ponseti method as the first method of treatment.

As regard to history of foot surgery and previous surgery that was performed on the children's foot, the present study illustrated that, more than one quarter of them have history of foot surgery and allof them undergoing tenotomy surgery. This finding congruent with **Dreise et al., (2023)** who conduct study in Uganda about “exploring bracing adherence in ponseti treatment of clubfoot: a comparative study of factors and outcomes in Uganda” and found that the most of the studied children performed had history of foot surgery undergoing tenotomy. This is due to the correction of equinus, where the foot points downward, is the last deformity corrected in the Ponseti method before surgery. Equinus is corrected by tenotomy to reach maximum dorsiflexion (**Sharma et al., 2022**).

Concerning the total mothers' knowledge, the present study revealed that, the majority of the studied mothers had

inadequate knowledge at pre-implementation of CCM regarding clubfoot. The inadequate level of knowledge among mothers' regarding clubfoot prior to implementation of CCM may be linked to the absence of required educational models as CCM aimed at enhancing mothers' knowledge and their practice. This finding congruent with **Alasbali, et al., (2023)** who conduct study in Saudi Arabia about "Assessing awareness and knowledge level of clubfoot among a rural city population in Saudi Arabia " and found that more than half of the studied mothers have inadequate level of knowledge in the assessment phase.

Meanwhile, the vast majority had adequate knowledge at post- implementation phase and the majority at follow-up phase. This emphasized that mothers' knowledge is positively impacted by the implementation of CCM, as evidenced by the vast majority of them have adequate knowledge after implementation the CCM. This increase in knowledge demonstrated the value of the researcher's teaching sessions of the CCM. Also, this improvement might also be linked to mothers' desire to learn new information, their active engagement in the model, and their consistent attendance, which are evident in the mothers' under study's knowledge scores.

This finding supports with **Chithra, (2019)** who found that the vast majority of the studied mothers had inadequate knowledge score at pretest and three quarters of them had adequate knowledge score at posttest. The study finding suggests that mothers' motivation to learn about clubfoot may help their children, as it impacts their quality of life and daily activities.

In addition, there were other studies confirm that continuous care model was very effective in improving knowledge level in other diseases such as **Sahebalzamani et al.,**

(2017) who conduct study about "Effects of a Continuous Care Model on Patients' Knowledge and Health-Related Quality of Life in Systemic Lupus Erythematosus" pointed out that continuous care model significantly improved patients' knowledge level after 3 months in patients with systemic lupus erythematosus, ($p < .001$). This could be due to the CCM is considered a comprehensive care plan that improving the mothers' knowledge, attitude and maintaining the continuity of care.

On assessing mothers' total satisfaction regarding their children undergoing congenital club foot surgery the present study illustrated that, the minority of mothers had high level of satisfaction at pre-implementation of CCM. This finding not in same line with **Evans et al., (2016)** who conduct study about "Walk for life - the National Clubfoot Project of Bangladesh: the four-year outcomes of 150 congenital clubfoot cases following Ponseti method" and found that the majority of mothers had high level of satisfaction in the assessment phase.

According to the researcher's perspective, the low level of satisfaction prior implementation of CCM may be related to lack of knowledge resources and educational program regarding club foot management, absence of nurse role as educators & mothers wouldn't feel that staff had time for their children. So, total satisfaction at pre-implementation was low.

On the other hand, the vast majority of mothers had high level of satisfaction at post and follow-up respectively. This finding agree with **Tsironi & Koulierakis, (2019)** who conduct study about "Factors affecting parents' satisfaction with pediatric wards" and found that more than three quarters of mothers had high level of satisfaction. According to the researcher's point of view, the application of the continuous care model

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will enhanced levels of satisfaction. Additionally, the ongoing process of sensitization through consistent participation at classes and follow-up care motivated, encouraged, and enabled mothers of children with clubfoot surgery to continue engaging in positive practice and this influence positively on their satisfaction.

Furthermore, other research has demonstrated that CCM significantly improves total satisfaction in different illnesses: such as **Ali et al., (2023)** who conduct study about “Effect of Continuous Care Model on Health-Related Behaviors, Satisfaction and Quality of Life among Infertile Women” and pointed out that introducing CCM significantly into practice has a positive impact on satisfaction.

According the total children' quality of life. The present study showed that, the vast majority of the studied children had poor quality of life at pre implementation. This finding inconsistent with **Rabbitts et al., (2015)** who conduct study about “Pain and Health-Related Quality of Life After Pediatric Inpatient Surgery” and found that majority of the studied children had good quality of life

According to the researcher's perspective, poor quality of life prior implementation of CCM may be related to lack of educational program regarding club foot care and nurse not participate in increasing the awareness of mothers about the condition. Child activities with friends has been limited due to physical health problem & mother was worried about his condition. So, total children' quality of life at pre-implementation was poor.

Meanwhile, the vast majority have good quality of life at post and follow-up respectively. This finding congruent with **Albokhari et al., (2019)** who conduct study about “Assessing health related quality of life

of school aged Saudi children in western province using the validated Arabic version of child health questionnaire-parent form-50” and found that there is relatively high scores in domains, indicating good QoL among the studied population.

This may be attributed to the effective implementation of CCM that assists in recognizing the child problems and his needs regarding clubfoot surgery and providing relevant knowledge and skills, which consequently helps in promoting health-related behaviors and prevent complications of surgery which ultimately improve the quality of life.

Furthermore, other research support the effectiveness of CCM in enhancing quality of life in various diseases such as **Sahebalzamani et al., (2017)** who pointed out that quality of life in patients with systemic lupus erythematosus improved in all dimensions after 3 months of applying CCM. In agreement with the current results, a study by **Baghaei et al., (2015)** who conduct study about “The effect of applying continuous care model on the quality of life in the heart failure” and reported that quality of life in heart failure patients was significantly increased in all dimensions by implementing the CCM over three months ($P < 0.001$)

The present study revealed that, the minority have infection and hematoma after one month and all and more than three quarter of them don't have infection and cast loosening after three months of implementation of continuous care model. This finding parallel with **Chotigavanichaya et al., (2017)** who conduct study in Thailand about “Complications Associated with Ponseti Serial Casting and Surgical Correction via Soft Tissue Release in Congenital Idiopathic Clubfoot” and found that the minority of them have wound

infection, followed by cast loosening after soft tissue release surgery.

The present study finding revealed that, all the studied children don't have relapsed foot after one month and the minority of them have relapsed foot after three months of implementation of continuous care model. This finding in the same line with **Patil et al., (2022)** who conduct study about "Treatment of Idiopathic Clubfoot by Ponseti Method: A Prospective Evaluation" and found that the minority of them have relapsed foot after three months. This could be explained by regular follow-up visits to the clinic and mothers' involvement in the process of clinical decision making though CCM are considered to be two effective strategies to promote healthy behaviors and improve clinical outcomes.

The number of cast complications was found to be lower after surgery. This was probably due to the fact that there was no cast force, because the foot was already in the plantigrade position after surgery. This finding in accordance with **Chotigavanichaya et al., (2017)** and found that the minority of them have cast complications.

The current study revealed that, there is a statistically significant difference in post-operative complications on discharge and follow up implementation of continuous care. From the researcher's point of view, the CCM enabled the mothers to acquire accurate knowledge which improved mother's self-confidence by increasing their participation in caring for their children and eventually minimize post-operative complications.

Furthermore, additional research has confirmed that the continuous care model is highly beneficial in enhancing quality of life and lowering complications related to various diseases: such as **Hagdoost et al., (2015)** who conduct study about "Effect of

application of continuous care model on quality of life and prevention of complications in coronary artery bypass graft surgery patients" and pointed out that CCM from aspects of quality of life and post-operative complications has positive effects on coronary artery bypass graft 's patients.

Regarding correlation between total mothers' knowledge score and satisfaction score. The present study revealed that, there is significant statistical positive correlation between total mothers' knowledge score and total satisfaction score at pre, post and follow-up implementation of CCM. This finding support with **Espinel et al., (2014)** who conduct study about "Patient Satisfaction in Pediatric Surgical Care" and found that positive correlations were noted between satisfaction and increased parental knowledge. A key component of improving mothers' satisfaction is educating them about their role in care of their children with clubfoot surgery.

The present study revealed that, there is significant statistical positive correlation between total mothers' satisfaction score and total children's quality of life score at pre, post & follow-up implementation of CCM. This finding parallel with **Altiok et al., (2019)** who conduct study about "Quality of life, satisfaction with life, and functional mobility of young adults with arthrogyrosis after leaving pediatric care" and found that positive correlations identified between the satisfaction and the quality of life. Mothers' who indicated that they were more satisfied had higher scores of quality of life.

Conclusion:

Continuous care model had a significant positive effect in improving mothers' knowledge and the outcomes of their children undergoing clubfoot surgery. Besides, there is significant statistical positive correlation

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between total knowledge level & total satisfaction score of the studied mothers & total children's quality of life score pre, post and follow up implementation of the continuous care model.

Recommendations:

• **For nursing practice:**

1- Continuing nurses' education through implementing continuous care model in surgical pediatric departments will help mothers along with their children to enhance their knowledge regarding club foot and improve their outcomes.

2- Inform nurses that continuous follow-up program is needed to support children and mothers to enhance quality of care and reduce post operative complications after surgery.

• **For nursing education:**

- Continuous Care Model implementation and care regarding clubfoot surgery and management can be included in the curriculum of graduates and postgraduate students of the faculty of nursing.

• **For hospital administration:**

- Hospital managers are encouraged to implement continuous care model training program for orthopedic/ surgical pediatric nurses and recommended to be included in the hospital protocol for management of child admitted & diagnosed with clubfoot and undergoing surgery.

Recommendations for further studies:

- Future research is suggested to compare the differences between continuous care model and other intervention.

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تأثير نموذج الرعاية المستمرة علي معلومات ورضا الأمهات ونتائج أطفالهن الذين يخضعون لجراحة حنف القدم

رقية عفيفي عبد الفضيل عفيفي- فانتن شفيق محمود - امال غريب سباق

حنف القدم الخلقي له تأثير كبير على الأداء البدني وحياة الطفل المصاب ويؤدي إلى انخفاض جودة الحياة للطفل. إحدى طرق تحسين جودة الحياة هي استخدام نموذج الرعاية المستمرة. الهدف: تقييم تأثير نموذج الرعاية المستمرة على معلومات الأمهات ورضاهن ونتائج أطفالهن الذين يخضعون لجراحة حنف القدم. تصميم الدراسة: تم استخدام التصميم شبه التجريبي لإجراء هذه الدراسة. مكان الدراسة: أجريت الدراسة في عيادات العظام الخارجية وأقسام جراحة العظام في مستشفى بنها الجامعي ومستشفى بنها التخصصي للأطفال. الموضوع: عينة غرضية مكونة من 50 طفلاً برفقة أمهاتهم. الأدوات: تم استخدام ثلاث أدوات لجمع البيانات: الأداة الأولى: استبيان المقابلة الشخصية، الأداة الثانية: استبيان رضا أمهات الأطفال، الأداة الثالثة: نتائج الأطفال وشملت استبيان صحة الطفل وورقة مضاعفات ما بعد الجراحة. النتائج: الغالبية العظمى من الأمهات الخاضعين للدراسة لديهن مستوى معلومات مناسب ومستوى عالٍ من الرضا و الغالبية العظمى من الأطفال لديهم نوعية حياة جيدة بعد شهر من تطبيق نموذج الرعاية المستمرة، وجميعهم غير مصابون بالعدوى والتجمع الدموي بعد ثلاثة أشهر من تنفيذ نموذج الرعاية المستمرة. الخلاصة: كان لتطبيق نموذج الرعاية المستمرة تأثير إيجابي كبير في تحسين معلومات الأمهات ورضاهن ونتائج أطفالهن الذين خضعوا لجراحة حنف القدم. التوصيات: يجب دمج نموذج الرعاية المستمرة كتدخل ترميضي للأطفال الذين يخضعون لجراحة حنف القدم.