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Impact of Clubfoot Diagnosis and Treatment on Parental Mental Health in Children

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ABSTRACT

Background: Clubfoot affects mental soundness of the care givers and dealing with its treatment can be psychosocially challenging for parents. The reliable tool for evaluating anxiety, depression, and stress is the DASS-21 (Depression, Anxiety, and Stress Scale-21). The aim of this study was to compare the levels of parental anxiety, stress, and depression before and after clubfoot treatment using the DASS-21 scale. The study assessed the differences in DASS-21 scores between parents with higher and lower education levels.

Methods: The study was conducted at a tertiary care hospital from January 21, 2022, to December 31, 2022. Forty parents of clubfoot patients were enrolled in the study by non-probability sampling method. The questionnaire was provided to the parents before the start of the Ponseti casting. The standard six-week Ponseti regimen was followed by TA tenotomy and full casting. The second questionnaire was given to the parents two weeks after the removal of the final cast. In this cross-sectional study, continuous variables are presented as mean ± standard deviation (SD). Paired t-tests were used to compare pre- and post-treatment outcomes, with statistical significance set at $p < 0.05$.

Results: Sixty-five percent(26) of the attendants were fathers. The majority of parents had an undergraduate level of education. Ten percent of parents reported experiencing stress before treatment. The mean DASS-21 scores before treatment were 6.35±1.29 for depression, 5.17±1.17 for anxiety, and 6.37±0.92 for stress. After treatment, the scores decreased to 0.92±0.61, 0.37±0.52, and 0.37±0.58, respectively. The overall mean DASS-21 score before treatment was 17.90±1.945, which significantly reduced to 1.68±0.693 ($p<0.001$) after treatment. Furthermore, the DASS-21 scores showed significant differences across age groups, parental background, and educational levels.

Conclusion: The overall DASS-21 score showed a significant reduction after treatment. Additionally, educational level demonstrated variation across the groups.

Keywords: Adjustment Depression, Anxiety, Stress, Ponseti castings, Clubfoot, Education

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INTRODUCTION

Idiopathic clubfoot, among the most prevalent congenital musculoskeletal anomalies (occurring in 1-2 per 1000 births), does not resolve spontaneously. This progressive deformity continues to develop throughout childhood into adulthood, leading to adverse outcomes if left untreated[1].

The Ponseti method is the first-line treatment for clubfoot, consisting of a series of six weeks of casting, Achilles tenotomy, and bracing. The success of the treatment depends on a team effort, which includes Ponseti-trained surgeons, parents, and primary healthcare providers [2].

Despite the widespread introduction of Ponseti treatment, including in low and middle-income countries (LMICs), coverage was only estimated at around 14% in 2015[3,4]. The rate of unsuccessful treatment remains high at approximately 53%, with significant variations observed among countries[5].the rate of surgical treatment for clubfoot has seen a notable decrease since the successful adoption of Ponseti method [6].

However, as with any other chronic disease or congenital deformity, clubfoot also brings many mental health problems for the caregivers. Accepting this congenital deformity and dealing with its treatment can be psychosocially challenging for parents of patients with congenital clubfoot. Depression, Anxiety, and stress can seriously affect the quality of their lives. It is already known that the surgery on children independently brings a negative psychological experience to the parent. Therefore, the level of stress becomes even worse when already affected minors are going through some surgical procedure[7].

The outcome of Ponseti casting from the perspective of children is broadly studied. However, the effect of clubfoot deformity itself and the outcome of the treatment on the parents' mental health and social status is an unexplored area. In previous studies, the topic was studied either insufficiently in terms of parental health, or the studies focused on the parental satisfaction achieved with casting only, without any surgical adjunct. A study done in 2021 in which they performed an interview-based study regarding function, pain, and social functioning of patients with only one question spared for the mental well-being of the parents: "How do you feel about the appearance of your child's foot?"[8]. Another study was conducted on the effect of improvement in Pirani scoring on parental mental distress without considering percutaneous Achilles tendon tenotomy[9].

The goal of this study was to assess the overall effect on the mental health of their parents when their children are diagnosed with clubfoot, and to observe the changes in their mental state over the course of treatment. The DASS-21 (depression, anxiety, and stress scale) is a reliable assessment tool, which

can be used by psychiatrists and other healthcare providers[10,11,12]. In this study, DASS-21 was used as an assessment tool first when the patient was diagnosed with the clubfoot deformity and subsequently after the treatment of the clubfoot. Moreover, the demographic data was assessed as to how mental health is related to their educational and socioeconomic status.

METHODS

This cross-sectional study was conducted between January 1, 2022 and December 31, 2022, at the Department of Orthopedic Surgery, Liaquat National Hospital, Karachi, Pakistan. The research was approved by the Research and Ethics Committee, Ref: **App # 0907-2023-LNH-ERC**. Parents of the enrolled children provided fully informed written consent.

This study was conducted with the hypotheses that the level of mental health disturbance in parents is decreased over the course of treatment, and that parents with higher education level suffer more than those with lower education level. A total 40 parents were enrolled. All data was retrospectively collected from medical records and analyze with non-probability sampling technique

Only biological parents of the patients aged ≤ one month and who did not have any additional congenital deformities other than club foot, and who underwent TA tenotomy in addition to serial casting were included in the study. Parents of those patients who had previously undergone some treatment for club foot were excluded. Club foot was diagnosed clinically, characterized by cavus, adductus of forefoot, varus and equinus. As part of the treatment, weekly casting was performed for 6 weeks followed by percutaneous Achilles tendon tenotomy and post procedure casting which was removed 2 weeks later.

With regard to education, bachelor's and higher degrees were categorized as higher education, while undergraduate degrees were also acknowledged as educational qualifications The DASS-21 was used for evaluation of stress, anxiety and depression among parents. DASS-21 is a self-assessment tool designed to evaluate anxiety, stress and depression of the patients negative emotional states. Demographic data, including age, sex, relationship with patients, and education status of parents were recorded on a questionnaire. Patients (children) with club foot were diagnosed on OPD basis from history and examination. The Urdu translated Proforma of the original version was handed over to the attendants (one of the parents) before first casting and after removal of post-surgery cast. The difference between the both scores was calculated.

Data was analyzed by using SPSS-25. Differences in pre-treatment and post-treatment DASS core was compared by independent sample t-test was applied to compare DASS score according to education status. P-values ≤0.05 were considered to be statistically significant.

RESULTS

Table 1: Descriptive statistics of demographics

Variable	No.	%
Patient's age (years)		
30 – 35	10	25.0
> 35	30	75.0
Parentage		
Mother	14	35.0
Father	26	65.0
Education		
Undergraduate	31	77.5
Postgraduate	9	22.5

It was observed that mostly 75% (n=30) patients were between 30-35 years with mean age of attendants was 33.30±2.33 years. Most attendants were fathers (65%, *n* = 26) accompanying their children, while mothers accounted for 35% (*n* = 14), which is nearly half the number of fathers. Regarding education, the majority of attendants (77%, *n* = 31) had an undergraduate level of education, while only 22.5% (*n* = 9) had attained a postgraduate degree **(Table 1).**

Before treatment, 45% (*n* = 18) of the parents experienced moderate depression, and an equal proportion (45%, *n* = 18) had mild depression. Regarding anxiety, 55% (*n* = 22) experienced mild anxiety, 35% (*n* = 14) had moderate anxiety, and 2.5% (*n* = 1) reported severe anxiety. Additionally, 10% (*n* = 4) of the parents experienced stress before treatment. Notably, all participants reported no symptoms of depression, anxiety, or stress after treatment **(Fig. 1).**

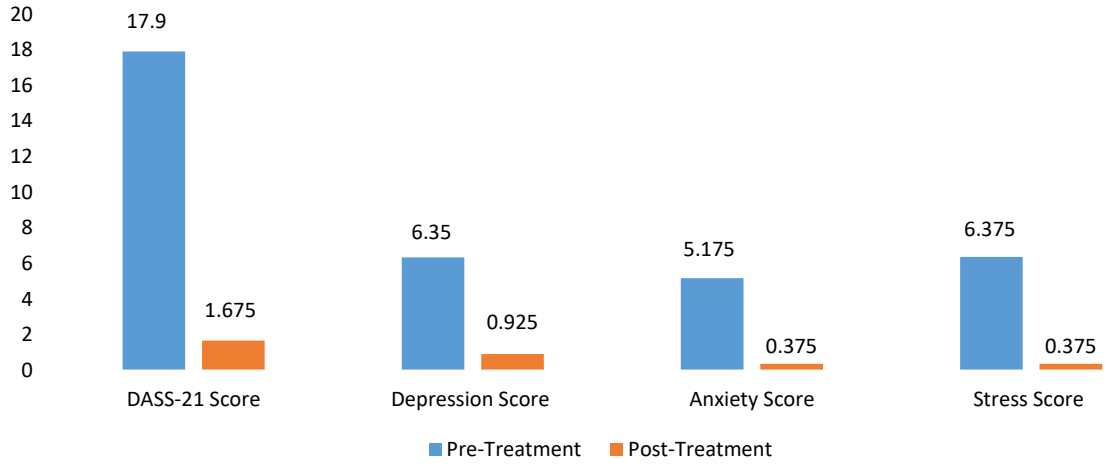

Fig. 1: Pre and Post Treatment mean depression, anxiety and stress according to DASS-21

Table 3: Frequency distribution of pre-treatment DASS-21of individual item

Pre Treatment DASS-21 items	0	1	2	3
I found it hard to wind down	37(92.5%)	3(7.5%)	-0	0
I noticed the dryness in my mouth.	37(92.5%)	3(7.5%)	0	0
I found myself unable to feel any positive emotions whatsoever.	32(80%)	7(17.5%)	1(2.5%)	0
I experienced breathing difficulty	33(82.5%)	7(17.5%)	0	0
I found it difficult to work up the initiative to do things	3(7.5%)	18(45%)	16(40%)	3(7.5%)
I tended to over-react to situations	4(10%)	25(62.5%)	11(27.5%)	0
I experienced trembling (e.g. in the hands)	2(5%)	26(65%)	12(30%)	0
I felt that I was using a lot of nervous energy	2(5%)	30(75%)	8(20%)	0
I was worried about situations in which I might panic and make a fool of myself	5(12.5%)	31(77.5%)	4(10%)	0
I felt that I had nothing to look forward to	2(5%)	29(72.5%)	9(22.5%)	0
I noticed that I was becoming increasingly agitated.	3(7.5%)	1(30%)	7(17.5%)	0

I found it difficult to relax	2(5%)	34(85%)	4(10%)	0
I felt disheartened and melancholic.	9(22.5%)	28(70%)	3(7.5%)	0
I was intolerant of anything that kept me from getting on with what I was doing	4(105)	33(82.5%)	3(7.5%)	0
I felt like I was on the brink of panic	4(10%)	31(77.5%)	5(12.5%)	0
I was unable to become enthusiastic about anything	5(12.5%)	30(75%)	5(12.5%)	0
I felt that my self-worth was low.	8(20%)	32(80%)	0	0
I felt that I was rather touchy	8(20%)	30(75%)	2(5%)	0
I was aware of the action of my heart in the absence of physical exertion	9(22.5%)	30(75%)	1(2.5%)	0
I felt scared without any good reason	8(20%)	29(72.5%)	3(7.5%)	0
I felt that there was no meaning to life.	9(22.5%)	29(72.5%)	2(5%)	0

0= It didn't pertain to me. 1= It applied to me to some extent or some of the time, 2= It applied to me to a significant extent, or for a considerable portion of time, 3= It applied to me intensely, or for the majority of the time.

Table 3 shows the frequency distribution of participants' responses to individual items of the pre-treatment DASS-21. Overall, most respondents reported no symptoms (score 0) or mild symptoms (score 1) across the majority of items. High proportions of score 0 responses (≥80%) were observed for items such as finding it hard to wind down, dryness of mouth, inability to feel positive emotions, breathing difficulty, and feeling disheartened, indicating minimal pre-treatment distress for these symptoms. Moderate symptoms (score 2) were less frequently endorsed, with the highest proportions observed for difficulty working up initiative (40%), experiencing trembling (30%), and over-reacting to situations (27.5%). Severe symptoms (score 3) were reported only for the item related to initiative (7.5%). Overall, the pattern suggests that while most participants experienced low levels of depression, anxiety, and stress symptoms before treatment, a few items—particularly those related to motivation, physiological arousal, and emotional reactivity—reflected higher levels of moderate symptom endorsement.

Table 4: Frequency distribution of pre-treatmentDASS-21of individual Item

Post Treatment DASS-21 Items	0	1	2	3
I found it hard to wind down	40(100%)	-0	0	0
I was aware of dryness of my mouth	40(100%)	0	0	0
I couldn't seem to experience any positive feeling at all	40(100%)	0	0	0
I experienced breathing difficulty	39(97.5%)	1(2.5%)	0	0
I struggled to muster the initiative to do things.	18(45%)	22(55%)	0	0
I tended to over-react to situations	35(87.5%)	5(12.5%)	0	0
I encountered trembling, such as in the hands.	37(92.5%)	3(7.5%)	0	0
I felt that I was using a lot of nervous energy	40(100%)	0	0	0
I was worried about situations in which I might panic and make a fool of myself	37(92.5%)	3(7.5%)	0	0
I felt that I had nothing to look forward to	34(85%)	6(15%)	0	0
I found myself getting agitated	37(92.5%)	3(7.5%)	0	0
I found it difficult to relax	37(92.5%)	3(7.5%)	0	0
I felt disheartened and melancholic.	38(95%)	2(5%)	0	0
I had little tolerance for anything that hindered my progress in what I was doing.	38(95%)	2(5%)	0	0
I felt I was close to panic	36(90%)	4(10%)	0	0
I was unable to become enthusiastic about anything	38(95%)	2(5%)	0	0
I felt I wasn't worth much as a person	37(92.5%)	3(7.5%)	0	0
I felt that I was quite sensitive.	38(95%)	2(5%)	0	0
I was aware of the action of my heart in the absence of physical exertion	38(95%)	2(5%)	0	0
I felt frightened for no apparent reason.	38(95%)	2(5%)	0	0

I felt that there was no meaning to life.	38(95%)	2(5%)	0	0

0= It didn't pertain to me. 1= It applied to me to some extent or some of the time, 2= It applied to me to a significant extent, or for a considerable portion of time, 3= It applied to me intensely, or for the majority of the time.

Table 4 presents the frequency distribution of post-treatment DASS-21 item responses. Following treatment, the majority of participants reported no symptoms (score 0) across nearly all items, indicating substantial improvement compared to pre-treatment levels. For several items—including difficulty winding down, dryness of mouth, inability to experience positive feelings, and feeling that they were using a lot of nervous energy—100% of participants endorsed a score of 0. Items reflecting physiological symptoms such as breathing difficulty, trembling, and awareness of heart action also showed very high rates of symptom absence (92.5% to 97.5%). Mild symptoms (score 1) were reported infrequently, most notably for difficulty mustering initiative (55%), lack of enthusiasm (5%), and feelings of being frightened without reason (5%), though none of these items reached moderate (score 2) or severe (score 3) levels. Overall, the distribution demonstrates a marked reduction in depression, anxiety, and stress symptoms following treatment, with most participants exhibiting complete or near-complete resolution of their pre-treatment emotional and physiological distress.

Table-5: Pre and post-treatment DASS-21 score

DASS-21 Score	Pre-Treatment	Post-Treatment	P value
Overall	17.90±1.94	1.67±0.69	<0.001*
Age 30 to 35 years	18.06±1.98	1.73±0.73	<0.001*
Age >35 years	17.40±1.83	1.50±0.52	<0.001*
Fathers	17.84±1.80	1.61±0.63	<0.001*
Mothers	18.00±2.25	1.78±0.80	<0.001*
Undergraduates	18.48±1.63	1.51±0.56	<0.001*
Postgraduates	15.88±1.61	2.22±0.83	<0.001*

*Significant at 0.01 level

Table 5 presents the comparison of pre- and post-treatment DASS-21 scores across different demographic groups. Overall, there was a significant reduction in mean DASS-21 scores from 17.90

± 1.94 before treatment to 1.67 ± 0.69 after treatment ($p < 0.001$), indicating a substantial improvement following the intervention. A similar significant decline was observed in both age groups: participants aged 30–35 years showed a decrease from 18.06 ± 1.98 to 1.73 ± 0.73, while those older than 35 years improved from 17.40 ± 1.83 to 1.50 ± 0.52 (both $p < 0.001$). Fathers and mothers exhibited comparable reductions, with fathers improving from 17.84 ± 1.80 to 1.61 ± 0.63 and mothers from 18.00 ± 2.25 to 1.78 ± 0.80 (both $p < 0.001$). In terms of education, undergraduates showed a decrease from 18.48 ± 1.63 to 1.51 ± 0.56, while postgraduates improved from 15.88 ± 1.61 to 2.22 ± 0.83, with both comparisons also significant at the 0.01 level. These results indicate that the treatment was effective across all demographic subgroups.

Table 6: Comparison of mean DASS-21 score pre and post-treatment

DASS-21 Score	Pre-Treatment	P-value	Post-Treatment	P-Value
Age 30 to 35 years	18.06±1.98	0.35	1.73±0.73	0.43
Age >35 years	17.40±1.83		1.50±0.52	
Fathers	17.84±1.80	0.81	1.61±0.63	0.46
Mothers	18.00±2.25		1.78±0.80	
Undergraduates	18.48±1.63	< 0.01*	1.51±0.56	< 0.01*
Postgraduates	15.88±1.61		2.22±0.83	

*Significant at 0.01 level

Table 6 shows the comparison of mean DASS-21 scores across different demographic groups before and after treatment. For most groups, including participants aged 30–35 years, those over 35 years, fathers, and mothers, the differences in mean scores within pre- or post-treatment groups were not statistically significant ($p > 0.05$). However, for the education subgroups, undergraduates demonstrated a significant reduction in DASS-21 scores both before and after treatment (pre-treatment 18.48 ± 1.63, post-treatment 1.51 ± 0.56, $p < 0.01$), indicating a notable effect of treatment within this group. Postgraduates showed improvement in mean scores (15.88 ± 1.61 pre-treatment to 2.22 ± 0.83 post-treatment), but these changes were not statistically significant. Overall, the table highlights that the intervention was particularly effective among undergraduates while changes in other subgroups were not statistically significant.

DISCUSSION

The study demonstrated a significant psychological impact on the parents during the Ponseti treatment course, with key findings revealing that before the treatment of the clubfoot, 90% of the parents exhibited depression, with anxiety in 92.5% and parents were affected by stress was 10%. In modern times, the preferred treatment is non-surgical, specifically the Ponseti method involving casting. The treatment period can be very stressful for parents, as they encounter various challenges, uncertainties, and anxieties. Failure by the surgeon to address these concerns may result in treatment failure, as parents may opt to discontinue treatment midway[14].

The research conducted in 2016 revealed that guardians or parents experienced a significant amount of stress during the casting period compared to the bracing period[15]. These findings are corroborated by another study, which indicated that 78.1% of parents reported anxiety during the Ponseti casting phase[14]. Similar to the results reported in prior studies, the results also show that the majority of the parents had mild anxiety before the start of treatment. Subsequently, over DASS scores were significantly reduced following completion of treatment. In this study, before treatment, depression was equally observed as moderate and mild among parents; however, only a very low percentage of parents had no depression before treatment. Mild anxiety was mostly observed among parents. As far as stress was concerned, most of the parents were stress-free. As far as the DASS score is concerned, it was significantly reduced after treatment as compared to before or start of the treatment.

Parents of infants diagnosed with clubfoot experience anxiety soon after birth, and the stress of treatment compounds this. Evidence from the study conducted in 2020 also supports this, indicating that parents endure severe anxiety and stress during the prolonged casting phase. However, it remains unclear whether this stress stems from the treatment itself or from the diagnosis of the disease[16]. The first three months of treatment are particularly challenging for families, especially during the casting phase.

In the modern era, the Ponseti method stands as a recognized and effective treatment for clubfoot. From the parents' perspective, satisfaction typically arises upon completion of the treatment, yet they commonly encounter significant challenges during the casting period, spanning from birth to three months. The primary difficulty revolves around infant irritability towards the cast and potential skin issues. Anticipated concerns regarding Achilles tenotomy and future bracing management can be addressed through thorough counselling of the parents[14]. Another study supports the notion of parents experiencing anxiety, depression, and stress related to the diagnosis of clubfoot and the implementation of the Ponseti treatment. Nevertheless, these signs of depression and anxiety tend to

diminish over time as the treatment progresses. Furthermore, education emerges as another factor directly correlated with these psychological effects[13].

With the introduction of new technology, prenatal diagnosis of clubfoot has become significantly easier. It's widely recognized that congenital anomalies often trigger feelings of fear, stress, anger, and guilt among parents of affected children[17,18]. This study also indicates that congenital clubfoot disease and its treatment can lead to heightened levels of depression, anxiety, and stress in parents. However, as parents adhere to the treatment and observe positive outcomes, these psychological effects tend to decrease over time[19].

As far as our knowledge extends, no regional study has yet explored the correlation between parents' literacy levels and the effects on congenital clubfoot diagnosis and treatment methods. However, there is one study indicating that the casting method has a greater impact on the mental health of parents from educated families. One possible explanation is that higher levels of education among parents bring about increased awareness and responsibility, potentially contributing to these mental health issues.

Multiple past studies indicate that mothers experience a greater impact from diseases compared to fathers, with higher levels of anxiety, depression, and stress observed in mothers than in fathers.; however, no statistical difference was identified[20,21]. The primary factors leading to these results are the physical and anxiety-related changes mothers undergo during the transition to parenthood. Mothers significantly influence the development of a child compared to fathers[22]. Studies in the relevant literature indicate that parents of a child with clubfoot need both medical guidance and psychological assistance[23].

Counselling sessions with such parents reduce their anxiety levels[24]. Additionally, multidisciplinary counselling provided by healthcare professionals may help alleviate parental anxiety[25].

The limitation of our study is the small sample size and its restriction to an urban setting only.

Further, this was conducted in a single healthcare centre so it may not be applied to general population.

CONCLUSION

This emphasizes the correlation between congenital clubfoot and the Ponseti method in relation to anxiety, depression, and stress. It suggests that the educational level of parents plays a significant role in their mental well-being concerning clubfoot. Interestingly, higher levels of education are

associated with increased depression and mental stress. However, as treatment progresses, there is a noticeable decrease in depression levels over time.

LIST OF ABBREVIATIONS

DASS-21: Depression, Anxiety, and Stress Scale-21

LMICs: low and middle-income countries

OPD: Out-patient Department

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None

CONFLICT OF INTEREST

None

PATIENT CONSENT

Written informed consent was taken from all participants before their inclusion in the study.

ETHICAL APPROVAL

Our study was approved by the study centre's Institutional Review Board, Reference Code: **0907-2023-LNH-ERC**.

ETHICAL APPROVAL

All authors contributed equally as per ICMJE policy.

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