Anxiety and Pain Severity in Children Based on Self-Report

Maryam Mirmotalebi, Behshid Garrusi* and Mina Danaei

Department of Social and Family Medicine, School of Medicine, Kerman University of Medical Science, Kerman, Iran

Abstract: *Background and Objective*: Evaluation of the severity of pain in children can help the medical team diagnose the type of disease. In this study, anxiety and pain intensity in children were examined based on self-report.

Materials and Methods: This cross-sectional study was performed in 2018 on 300 children aged 3 to 12 years, referring to outpatient treatment centres in Kerman. To measure the severity of pain felt by children, FPS-R was used. The level declared by children was evaluated by the pain intensity estimated by parents and doctors using a visual analogue scale (VAS) and the standard FLACC (Face, Legs, Activity, Cry, Consolability scale) for correlation. The data were analysed using SPSS software version 25.

Results: The pain reported by children was obtained by VAS (4.16 ± 3.49), and the estimated pain by the doctor was obtained by FPS-R (2.87±1.68). The pain severity estimated by the doctor using FLACC had the highest correlation with the pain estimated by the doctor using VAS and the lowest correlation with the pain estimated by the mother using VAS.

Conclusion: The results of this study showed that FPS-R could be used as a suitable self-report tool in children and, along with the standard FLACC, can help the medical team recognize the severity of children's pain.

Keywords: Anxiety, Severity of pain, Children, Self-Report.

INTRODUCTION

Pain is the most common cause of patients referring to health centres and the most common clinical complaint. And it is one of the most important defences and support mechanisms of the body that appears in abnormal conditions. Because of the importance of pain and its control, the American Pain Association has named it the fifth vital sign and pain control as one of the most important health indicators. Whenever pain is quantitatively and qualitatively examined, as severe as other symptoms are observed, it will help the medical team to provide better pharmacological and non-pharmacological treatments [1].

In children, this phenomenon is a complex, dynamic, and mental experience that helps the child's development and helps them protect themselves from danger and accidents. Every day, children learn effective ways to deal with and prevent pain and grow with it. However, acute, chronic, and recurrent pain associated with diseases or medical care may have psychological consequences. As in the case of other symptoms, the first step in diagnosing and treating the disease is to evaluate the symptoms. In the case of pain, the first step is to assess it. Therefore, pain assessment provides the basis for its treatment. Factors such as stress and anxiety in children, as well as pain from illness and other injuries, cause fear, panic, impairment in the child's level of self-confidence, cause a feeling of lack of control over life and return to previous developmental stages [2-4].

Evaluation of pain and anxiety in children can be considered a basis for diagnosing and treating paediatric diseases. To do this, various tools have been used, which are based on self-report by the child. Each of these tools has its advantages, disadvantages, and defects, and more research is needed to find the best tool. This tool is more important and effective in children 3 to 6 years old who are less able to express their problems [5, 6].

In 2017, Emmott *et al*. evaluated the value and validity of the FACES Pain Scale-Revised (FPS-R) for preschool children. In this study, children were divided into two groups. In one group, children were asked about having pain. If their answer was yes, in the next step, they were shown the shape of the faces to assess the size of the pain, and the pain severity was classified as mild, moderate, and severe [7]. In examining pain, Hadden *et al*. found that younger children needed smarter judgments to observe and draw conclusions. Multidimensional tools, such as faces to detect pain in children, help behavioural therapists more easily understand the characteristics of pain in children, and prevent items from being re-examined. Finally, it was stated that tools such as faces could be a great help in measuring children's pain [8]. Facial assessments (use of faces and mannequins) are used to examine the emotional

*Address correspondence to this author at the Department of Social and Family Medicine, School of Medicine, Kerman University of Medical Science, Kerman, Iran; Tel: 00983433257313; Fax: 00983433257112;
E-mail: behshidgarrusi@chmail.ir

stages. In these evaluations, different scores are given to the faces to measure different levels of emotional responses.

Some pain behaviours manifest themselves automatically and spontaneously, although others control it voluntarily. Sekhon *et al*. observed a difference between observational pain reporting and pain measurement in children aged 4-12 years [9].

Considering the importance of assessing pain severity in children in recognizing the type of disease and thus helping to treat it, this study was conducted to assess pain severity self-reported by children referring to medical centres in Kerman. To do this, the severity of the pain reported by children was assessed by using FPS-R. To identify the quality of this method, the severity of the pain estimated by parents and physicians was measured using VAS to determine how parents and physicians estimate different pain severity from the pain reported by children. Finally, the pain severity estimated by parents and physicians, along with the pain severity reported by the child, was evaluated using standard FLACC, and correlations of different methods were compared.

MATERIALS AND METHODS

This was a cross-sectional study performed in 2018 for 12 months on children aged 3 to 12 years referred to the outpatient emergency ward of Afzalipour Hospital, family physician clinic, and pediatric clinic of Besat clinics in Kerman. The study (code of ethics IR.KMU.AH.REC.1397.042) was approved by the Research Ethics Committee of the University of Medical Sciences.

To determine the sample size by considering the correlation coefficient of 0.2 and the first type error 0.05, and the second type error was 0.1, the statistical population was estimated at 260 people. Finally, 300 children were selected by convenient sampling and included in the study. The inclusion criterion was the child and parents' consent, age 3 to 6 years, and referring to the outpatient wards of the mentioned centres. Subsequently, children who were hospitalized or in need of supervision were excluded from the study.

The data including the child's age, monthly visits to the doctor, parental occupation and education, and the child's birth rate was collected using the child and parent information form. Intensity of pain experienced by the child was measured by Faces Pain Scale-Revised (FPS-R) by selecting the closest mode shown by faces. In this test, cartoon images of a simple face that shows certain emotional states are shown to the child. The images are such that a face starts with a neutral emotion on the left and leads to a very anxious face on the right of the image. The child was asked to choose the closest image; each of the images scores 0, 2, 4, 6, 8, and 10, respectively, from left to right, with a higher score indicating that the child feels more pain. Studies have shown that this tool is a reliable tool for assessing the severity of pain in children, and a systematic review study also emphasizes that FPS-R is a reliable tool for measuring pain in children, especially children under five years [10, 11].

In order to evaluate the estimated pain intensity of the child by the parents and the doctor, the visual analogue scale (VAS) was used, which is a 10-unit ruler (zero is minimum pain intensity and 10 is maximum pain intensity) with the term 'no pain' at the left end of the ruler and 'the worst possible pain' at the right end. This tool is one of the most widely used tools in measuring pain severity, which can be easily used in addition to its validity and reliability. In the present study, each parent who came with the child and if both parents came, both parents were asked to complete VAS and determine the severity of their child's pain. The researcher (physician in charge of visiting the child) also determined her estimate of the child's pain severity according to this scale [12].

Finally, in order to assess the severity of pain and anxiety in children, the physician used FLACC as a standard scale (Gold standard) to assess pain severity. The pain-induced behavioural scale consists of five sections: faces, legs, activity, cry, and concealability. Each section has a score of zero to two. A higher score indicates a more severe behavioural response to pain. The score of each section is entered separately, and then five sections are added together to calculate the total pain score. The score range is from zero (lowest) to 10 (highest). The overall score is divided into three categories: 0 to 3 (mild pain), 4 to 7 (moderate pain), and 7 to 10 (severe pain). The validity of the instrument has been confirmed using the content validity method by Berghmans *et al*. by ten nursing teachers [13]. The reliability of this instrument was calculated by Tavasoli using the test-retest method using a correlation coefficient at 0.74. Castarlenas *et al*. confirmed the formal and content validity of the instrument and estimated the instrument's reliability by the test-retest method using a correlation coefficient at 0.85 [14]. The doctor also identified the diagnosis in the form of a

group of thyroid problems, growth disorders, infectious diseases, and other questionnaire items.

After collecting and entering the data, final data analysis was performed using SPSS software version 20 and using independent t-test, one-way analysis of variance, and Pearson correlation coefficient at the significant level of 0.05.

RESULTS

The mean age of children participating in the study was 6.99±2.65 years. Most of the participants were girls (65.7%) and 167 people who completed the information referred to medical centres with their mothers, and 101 people referred to medical centres with both parents (Table **1**).

Table 1: Distribution of Participants Based on the Evaluated Variables

Variable	N (%)
Gender	
Male	103 (34.3)
Female	197 (65.7)
Monthly visits to the doctor	
Yes	98 (32.7)
No	202 (67.3)
Father's education	
Illiterate	21 (7.0)
Under diploma	94 (31.3)
Diploma	136 (45.3)
Academic education	48 (16.0)
Father's occupation	
Health worker	9 (3.0)
Employee of other government departments	46 (15.3)
Self-employed	209 (69.7)
Unemployed	28 (9.3)
Retired	8 (2.7)
Mother's education	
Illiterate	20 (6.7)
Under diploma	67 (22.3)
Diploma	135 (45.0)
Academic education	78 (25.0)
Mother's occupation	
Health worker	15 (5.0)
Employee of other government departments	25 (8.3)
Self-employed	24 (8.0)
Housewife	236 (78.7)
Childbirth rate	
First	139 (46.3)
Second	94 (31.3)
Third and higher	65 (21.7)
Diagnosis by doctor	
Thyroid problems	15 (5.0)
Growth problems	42 (14.0)
Infectious diseases	109 (36.3)
Other	134 (44.7)

The mean pain severity calculated by the child with FPS-R was equal to 4.16±3.49, and the pain severity estimated by the doctor with the same instrument was 2.87±1.68. This value estimated by mothers and fathers with FPS-R was 4.36±2.70 and 4.43±2.77, respectively. Moreover, the mean obtained by FLACC by the doctor was 4.39±0.98 (Table **2**).

Table 2: Descriptive Results of Pain Severity Estimated by the Child, Parents, and Physician with the Used Tools

Tool	Mean	SD	Range
FPS-R completed by the child	4.16	3.49	0-10
VAS completed by the mother	4.36	2.70	0-9
VAS Completed by the father	4.43	2.77	0-10
VAS completed by the physician	2.87	1.68	0-10
FLACC completed by the physician	4.39	0.98	4-9

The results showed a weak correlation (r = 0.26) between the pain score estimated by the child using FPS-R and the pain score estimated by the doctor using FLACC as the gold standard instrument, while there was a weak correlation (r = 0.51) between the pain score estimated by the child using FPS-R as the tested instrument and the pain score estimated by the doctor using VAS ($p<0.001$). This correlation was also obtained between the mean estimated score by the father (r = 0.34) and the mother (r = 0.50) with the amount of pain reported by the child ($p<0.001$). The results also showed a significant relationship between educational status, mother's job, the order of birth, and type of disease with the severity of pain expressed by the child ($p<0.05$). Estimated pain severity by the mother showed a significant relationship with her education ($p<0.05$). Regarding the estimated pain severity by the father, this significant relationship was observed in gender and monthly visits to the doctor ($p<0.05$). Regarding the estimated pain severity by the doctor, the order of birth and the type of disease diagnosed showed a significant relationship with the estimated pain severity ($p<0.05$) (Table **3**).

Moreover, the results of this study showed that pain severity estimated by the mother with VAS was correlated with pain severity assessed by the father

Table 3: Comparison of the Mean Score of the Pain Estimated by the Child, Parents, and Physician Based on the Studied Criteria

Variable	Pain estimated by the child with FPS-R		Pain estimated by the mother with VAS		Pain estimated by the father with VAS		Pain estimated by the physician with VAS	
	mean±SD	P-value	mean±SD	P-value	mean±SD	P-value	mean±SD	P-value
Gender								
Male	4.54±3.52	0.17	4.52±2.58	0.150	3.59±2.34	0.010	2.88±1.82	0.942
Female	3.95±3.46		4.28±2.76		4.86±2.89		2.86±1.68	
Mother's education								
Illiterate	6.00±3.43	0.008	5.11±3.28	0.001	-		3.15±2.059	0.662
Under diploma	4.80±3.68		5.46±2.74		-		3.03±1.842	
Diploma	3.55±3.29		4.10±2.39		-		2.778±1.628	
Academic	4.17±3.46		3.66±2.71		-		2.833±1.541	
Mother's occupation								
Employed	4.42±3.46	0.04	3.74±2.68	0.525	-		3.746±2.682	0.525
Housewife	4.09±3.50		4.54±2.69		-		4.542±2.691	
Father's education								
Illeterate	2.8±2.82	0.12	-	-	2.8±2.821	0.127	2.8±2.821	0.127
Under diploma	4.91±2.88		-		4.91±2.88		4.917±2.888	
Diploma	4.776±2.76		-		4.776±2.76		4.776±2.76	
Academic	4.21±9.65		-		4.21±9.65		4.21±9.65	
Father's occupation								
Employed	4.42±2.71	0.95	-	-	4.42±2.71	0.95	2.909±1.697	0.32
Retired/unemployed	4.47±3.28		-		4.47±3.28		2.61±1.57	
Birth rate								
First	3.73±3.42	0.02	4.23±2.64	0.30	4.51±2.91	0.55	2.61±1.69	0.005
Second	4.13±3.59		4.19±2.53		4.14±2.42		2.87±1.45	
Third and higher	5.26±3.35		4.83±3.02		4.83±3.08		3.43±1.87	
Type of disease diagnosed by the doctor								
Non-infectious	3.82±3.47	0.03	4.15±2.82	0.09	4.31±2.84	0.47	2.72±1.76	0.04
Infectious	4.75±3.46		4.72±2.45		4.66±2.66		3.12±1.49	
Monthly visit to the physician								
Yes	4.44±3.51	0.33	4.80±2.70	0.07	5.25±2.90	0.027	2.93±1.77	0.64
No	4.02±3.47		4.15±2.68		4.10±2.66		3.84±1.64	

with VAS (r = 0.30) and pain severity evaluated by the doctor with VAS (r = 0.46). For this estimate, the lowest correlation for pain severity was calculated with FLACC (r = 0.12). A significant correlation was observed in all indices (p<0.001).

Estimated pain severity reported by the father with VAS was correlated with pain severity evaluated by the doctor with VAS (r = 0.53) and with FLACC (r = 0.13). Finally, a correlation was found between the estimated pain severity by the doctor with VAS and the result obtained by FLACC (r = 0.26). There was also a significant difference in the pain evaluated by parents and the doctor between the groups (p<0.001).

There was also a significant weak correlation (r = 0.26) between the pain score estimated by the child with FPS-R and the pain score calculated by the doctor with FLACC, while there was a relatively good significant correlation (r = 0.51) between the pain score

Table 4: Pearson Correlation between Results of Pain Severity Reported by the Child, Parents, Physician and the Results Obtained by VAS, FPS-R, and FLACC

Tool		FPS-R completed by the child	VAS completed by mother	VAS completed by father	VAS completed by the physician	FLACC completed by the physician
FPS-R completed by the child	Pearson r	1.00	0.50	0.34	0.51	0.26
	P-value	-	<0.001	<0.001	<0.001	<0.001
VAS completed by mother	Pearson r	0.50	1.00	0.30	0.46	0.12
	P-value	<0.001	-	<0.001	<0.001	0.049
VAS completed by father	Pearson r	0.34	0.30	1.00	0.53	0.13
	P-value	<0.001	<0.001	-	<0.001	0.109
VAS completed by physician	Pearson r	0.51	0.46	0.53	1.00	0.26
	P-value	<0.001	<0.001	<0.001	-	<0.001
FLACC completed by physician	Pearson r	0.26	0.12	0.13	0.26	1.00
	P-value	<0.001	0.049	0.109	<0.001	-

estimated by the child with FPS-R and the pain score evaluated by the doctor with VAS (p<0.001) (Table **4**).

DISCUSSION

Identifying methods that assess the severity of pain in children will help to understand the disease and prescribe appropriate treatment to solve the child's problem. This study evaluated the pain severity in children referred to the outpatient ward of Afzalipour Hospital and Pediatric Clinic and Besat Clinic in Kerman based on self-report using FPS-R; and was compared the mean pain severity obtained with pain severity estimated by the father, mother, and doctor. FLACC was used as a standard tool for this assessment to evaluate the accuracy of the estimated pain severity. In previous studies, various tools were used to assess the severity of pain in children; for example, Tsze *et al*. assessed pain severity using VAS during venipuncture at 5.2±2.0 [15]. This pain severity was reported by Foroud *et al*. in pregnant women who gave birth for the first time at 5.22±0.67 [10]. Bikmoradi *et al*. reported pain severity at 4.60±1.75 in women with MS [11]. Pain severity in children varies according to the VAS test in different studies. Safari *et al*. estimated this value at 7.76±2.55 during venepuncture [12]. In a study by Berghmans *et al*., preoperative pain severity in children undergoing surgery varied from 0.68 to 0.73 (13), and Devillier *et al*. reported this value at 0.76 in children with allergic rhinitis [20]. Assessment of pain severity by FPS-R in a study conducted by Castarlenas *et al*. showed that 301 studies used this tool to assess pain severity in children, in the majority of which, this tool shows the pain severity well in children [14].

Examining the correlation of the instruments used showed that the mean pain severity calculated with all instruments is different from the estimated pain severity by parents, which indicates the effect of their emotions in a higher estimate. This pain severity was significantly different from the value reported by the doctor. A comparison of the mean pain score estimated by the child using FPS-R showed that this mean was significantly related to the child's age, mother's education and employment status, birth order, and the type of disease diagnosed by the physician. This difference was consistent with Tsze, Brown, and von Baeyer, who reported that pain severity estimated by standard instruments was different from VAS [15-17].

Comparing the pain score estimated by the mother using VAS showed that this score has a significant relationship only with the mother's education, which indicates that the pain estimated by the mother is close to the real value with increasing mothers' awareness of children's problems. However, a comparison of the mean pain score estimated by the father using VAS showed that this mean was only significantly related to monthly visits to the physician and the child's gender. Chambers *et al*. reviewed tools for estimating pain severity in preschool children and reported that there was a significant relationship between the pain severity reported by the child and the estimated pain severity by parents when visiting the hospital or immediately after surgery. However, over time, the severity of pain reported by children differed from the estimated severity of pain reported by parents. In general, the effect of emotions on the expression of pain severity by parents decreases over time, and the expression of

issues becomes closer to reality [18]. In a review study by Zhou *et al*. on the relationship between self-reporting pain severity by child, parents, and nurses, there was a correlation between pain severity reported by child and parents (r = 0.64), between pain severity reported by child and nurses (r =0.58), and between pain severity reported by parents and nurses (r = 0.49) [19].

Moreover, comparing the mean pain score estimated by the doctor using VAS showed that this mean was significantly related to the order of birth and type of disease diagnosed by the doctor. These results are consistent with Manne and Brudvic, in which the amount of pain estimated by nurses, physicians, and other medical staff was different. For example, there was the least difference in the age groups of 9 to 12 years, and there was the largest difference in the age group of 5 to 8 years between the reported pain severity and the estimated pain [20].

Numerous studies have evaluated the correlations and differences between pain measurement tools in children. For example, Azevedo *et al*. evaluated the correlation between PPPM and FPS-R for measuring tonsillectomy pain in children aged 3 to 12 years [21]. Newman *et al*. evaluated two methods, FPS-R and WBFPS (Wong-Baker Faces Pain Scale) [22]. Subhashini *et al*. compared the efficiency of FPS-R and drawing with coloured pencils [23]. In this study, it was found that the pain estimated by the parents and the physician is different from the pain severity reported by the child and FLACC.

Among the limitations of this study are the small statistical population (as this study was performed only in the outpatient ward of Afzalipour Hospital, family physician clinic, and pediatric clinic of Besat clinics in Kerman) and parents' lack of cooperation in completing the questionnaires. Future studies can examine the severity of pain in children, and the effectiveness of pain severity estimation tools in a larger statistical population, and the best tools for assessing pain severity in children who are not able to report pain severity well. The results of this study showed that the severity of pain self-reported by children using FPS-R could be a good tool to identify children's problems. This value has a good correlation with pain severity measured by standard FLACC. Regarding the pain severity estimated by parents using VAS, it has less correlation with standard FLACC and cannot be used as a suitable indicator to assess the pain severity of children. The correlation of pain severity reported by physicians using VAS was higher than that of pain severity estimated by parents; thus, the pain estimated by physicians is more valid than the pain estimated by parents. Accordingly, measuring pain severity by both FPS-R and VAS can considerably help determine pain severity upon arrival at the hospital accurately and make diagnosis and determine the proper treatment for children.

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