Research Article

Broader Autism Phenotype and Communication Skills in Parents of Children with Autism

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ABSTRACT

Introduction: This study aimed to determine the communication profile of parents of children with autism spectrum disorders (ASD) and parents of typically developing children (TDC).

Materials and Methods: Broad autism phenotype and communication skills were measured using the broad autism phenotype questionnaire (BAPQ) and the Queendom communication skill test (QCST) in parents of children with ASD and parents of TDC. Participants included 346 parents of children with ASD and parents of TDC. In the ASD group, participants included 172 parents (76 fathers and 96 mothers) of children diagnosed with ASD. The TDC parent group included parents 174 (85 fathers and 89 mothers). In the autism group, at least one child had autism and in the opposite group, the child had no psychological problems. Two-way analysis of variance (ANOVA) was performed to examine the effects of group (TDC, ASD) and gender (male, female) on study variables.

Results: A significant group-gender interaction was observed for BAPQ total scores ($F_{(1,342)}$=4.28, P=0.039); Mothers of children with ASD reported higher BAPQ total scores than mothers of TDC (P=0.006), and mothers of TDC reported lower BAPQ total scores than fathers of TDC (P<0.001). A significant group-gender interaction was also observed for QCST total scores ($F_{(1,342)}$=11.66, P<0.001); Mothers of children with ASD reported lower QCST total scores than mothers of TDC (P<0.001), and among parents of TDC, mothers had higher levels of QCST total scores than fathers (P<0.001). A negative significant correlation was observed between BAPQ and QCST total scores (r=-0.499, P<0.001).

Conclusion: The results of this study showed a difference between parents' communication skills in the two groups. Parents of children with ASD have more communication characteristics of autism than the control group, Fathers in the ASD group scored higher in the total scores of autism communication traits and some subtests which require further research in this area.

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1. Introduction

Autism spectrum disorder (ASD) is a lifelong, complex developmental disorder characterized by deficits in social interactions, verbal and nonverbal communication, repetitive activities, and limited interests [1, 2]. A wide variety of severity and type of symptoms exists in people with ASD. The rate of ASD has been increasing significantly in recent years and its rate is reported to be 1% of the population [3-5]. The increasing prevalence of this disorder in recent years (1 in 59) has made it one of the most common disorders. According to a study by [6] 2019, the prevalence of ASD in Iran can be similar to developed countries about 1% (10 per 10000. In addition to the core symptoms, problems, such as anxiety, intellectual disability, epilepsy, attention deficit, hyperactivity disorder (ADHD), and self-injury behaviors are reported in ASD [6-8]. In addition to the core symptoms, problems, such as anxiety, intellectual disability, epilepsy, enuresis and ADHD, self-injury, and hyperactivity are reported in this population [6-8]. Despite advances in biomedicine, no medical tests or biological signs are observed to diagnose autism. Therefore, diagnosis is based on the pattern of behavioral symptoms [9, 10].

Approximately 70% of people with autism show a range of intellectual disabilities, and their language comprehension and expression are disproportionate to age or disability in these areas [11, 12]. Mild impairments in communication and social skills among relatives of autistic individuals have been reported as a broad phenotype of autism [13]. The broader autism phenotype (BAP) is used to describe personality traits that are similar to individuals diagnosed with autism and often occur in relatives of people with ASD. Various studies have shown the effects of genetics on ASD [14-17]. Ruser et al., using the Pragmatic Rating Scale (PRS), reported deficiencies in language pragmatism among autistic relatives [13]. Some studies consider autism to be a neurological disorder with a genetic etiology [18, 19]. In autistic twins, the evidence shows that genetic factors play a role. Harley et al. examined language and personality characteristics in 86 parents of children with ASD and 64 parents in the control group using a BAP checklist. Parents of children with ASD showed significant disabilities isolated personality, reduced flexibility, and language pragmatic [15].

In 2008, Bishop and colleagues examined the identification of broad phenotypes in parents of children with ASD using self-assessment. Two subscales of social and communication skills in parents of children with ASD had higher scores than the control group, which indicated weakness in these components [20]. Whitehouse et al. conducted a study on 238 parents of children with ASD and 187 parents of typically developing children (TDC) using the adult communication checklist. Most parents of children with ASD had lower scores on cognitive skills. These parents also showed low social-communicative reactivity in the area of social competence [21]. Mohammadi et al. examined the BAP in parents of children with ASD and parents of TDC [22]. Both groups completed the Persian version of the autism-spectrum quotient (AQ). The results of this study showed that parents of autistic children had significantly higher scores than the control group. In addition, the total AQ score and communication skills and attention change scales in parents of children with ASD were higher than the normal group.

This study aimed to determine and compare communication skills in parents of children with ASD and parents of TDC via self-assessment. While introducing two BAP questionnaires of autism and queendom communication skill test (QCST) as two tools to measure communication skills in Persian, this study aimed to confirm the range of communication characteristics in parents with two tests of communication skills in Iranian culture and society. These two tests were able to show more accurate and broader specifications of communication skills in these two groups of parents for comparison, according to the different sub-items of their communication characteristics.

2. Materials and Methods

Participants and study design

Participants included 346 parents of children with ASD and parents of TDC. In the ASD group, participants included 172 parents (76 fathers and 96 mothers) of children diagnosed with ASD. The group of parents of TDC included 174 parents (85 fathers and 89 mothers). The inclusion criteria in the autism group included having a child diagnosed with ASD according to experts, the participation of both parents with children with autism in this study, minimum literacy, not having other psychiatric disorders in children (such as developmental and mental disorders), non-separation of parents, not having depressive symptoms in parents. The inclusion criteria in the normal group include not having psychiatric disorders in

children (such as autism spectrum disorders, depression, and other developmental disorders ...), involvement of both parents in the research, minimum literacy, non-separation of parents, and not taking anti-depressant drugs. The exclusion criteria in each group included not having one of the inclusion criteria, dissatisfaction of one of the parents with inclusion in the study, and lack of cooperation in the questionnaire based on self-report on a questionnaire administered during completing the broad autism phenotype questionnaire (BAPQ).

Instruments

Broad autism phenotype questionnaire (BAPQ)

The BAPQ was developed by Hurley et al. to measure the autism trait in adults. It consists of 36 statements in three domains, such as aloof personality, rigid personality, and pragmatic language, and each statement is rated on a Likert scale (1=very rarely to 6=very often). An aloof personality is defined as a lack of interest in or between social interactions. A character with a rigid personality is defined as having low interest in change or difficulty in adjusting to change. Pragmatic language problems point to deficiencies in the social aspects of language that lead to communication problems in interpersonal communication.

Queendom communication skills test-revised questionnaire (QCST-R)

This questionnaire measures five areas of communication skills in adults including insight, verbal expression, assertiveness, listening, and emotional management. The questionnaire is composed of 34 items answered on a 5-point Likert scale. In the study by Hossein Chari & Fadakar, this questionnaire presented a high level of internal consistency (Cronbach's alpha=0.81) [23]. Examples of items are as follows: "My partner asks me questions and I refuse to answer", and "While my partner tries to discuss a matter with me, I change the topic".

Statistical analysis

In this study, continuous variables were expressed as Mean±SD and categorical variables as frequency (percentage). Two-way analysis of variance (ANOVA) was used to examine the effects of group (TDC, ASD), sex (male, female), and group by gender interactions on study variables. The Relationship between BAPQ and QCST scores was examined using the Pearson correlation coefficient. Data were analyzed using SPSS software, version 16. P<0.05 was considered statistically significant.

3. Results

Demographic characteristics

Table 1 presents the demographic characteristics of TDC and ASD groups. No significant differences were observed between ASD and TDC groups in child's age (P=0.068), parental age (P=0.160), father's age (P=0.384), and mother's age (P=0.111). Groups were also matched for education (P=0.262) and occupational level (P=0.582), as well as for the number of children (P=0.868).

Validation of the Broad Autism Phenotype Questionnaire (BAPQ)

Two-way ANOVA was run to examine the effect of group and gender on BAP total scores as well as all subscales. As presented in Table 2 and Figure 1, a significant interaction was observed between group and gender on BAP total scores ($F_{(1,342)}$=4.28, P=0.039), indicating that the relationship between the group and BAPQ total scores depends on the gender. The mean BAPQ total score for mothers of children with ASD was higher than for mothers of TDC (P=0.006); however, no differences were observed between fathers of children with ASD and fathers of TDC (P=0.796). Among parents of TDC, mothers had lower levels of BAPQ total scores than fathers (P<0.001); however, this difference was not found in parents of children with ASD (P=0.527). Also, a significant group×sex interaction was observed on aloof scores ($F_{(1,342)}$=6.61, P=0.011). Results showed a higher level of aloof scores in mothers of children with ASD than in mothers of TDC (P=0.005), while no significant difference existed between fathers of children with ASD and fathers of TDC (P=0.385). In parents of TDC, mothers had lower levels of aloof scores than fathers (P=0.002); however, this difference was not observed in parents of children with ASD (P=0.595). For Pragmatic Language, two-way ANOVA indicated the main effect for the gender of the parent ($F_{(1,342)}$=6.79, P=0.010) but not for the group ($F_{(1,342)}$=1.61, P=0.205). Mean scores on pragmatic language were lower for mothers than for fathers. The group×sex interaction effect was not significant ($F_{(1,342)}$=0.096, P=0.327), indicating that the effect of sex did not differ significantly across groups. The same results were also found for rigid subscale scores (Table 2).

Table 1. Demographic characteristics of TDC and ASD groups

Demographic Characteristics		Mean±SD/No. (%)		P
		TDC	ASD	
Age (y)	Children	9.54±5.35	8.59±4.25	0.068
	Parents	38.23±6.58	39.24±6.72	0.160
	Fathers	40.49±6.41	41.38±6.48	0.384
	Mothers	36.07±6.03	37.54±6.45	0.111
Gender of children	Male	46(51.1)	66(67.3)	0.023
	Female	44(48.9)	32(32.7)	
Gender of parents	Male	85(48.9)	76(44.2)	0.384
	Female	89(51.1)	96(55.8)	
Education level of parents	Primary	22(12.6)	28(16.3)	0.262
	Secondary	54(31.0)	62(36.0)	
	University	98(56.3)	8(47.7)	
Occupation of parents	Employed	91(52.3)	94(54.7)	0.582
	Unemployed	83(47.7)	78(45.3)	
Number of children	1	45(50.0)	48(49.0)	0.868
	2	35(38.9)	41 (41.8)	
	≥ 3	10(11.1)	9(9.1)	

TDC: Typically Developing Children; ASD: Autism Spectrum Disorder.

Queendom communication skill test (QCST)

As presented in Table 3 and Figure 1, significant interactions were observed between group and gender on the Queendom communication skill test total scores ($F_{(1,342)}$=11.66, P<0.001), indicating that the relationship between the group and QCST total scores depends on the gender. The mean QCST total score for mothers of children with ASD was lower than mothers of TDC (P<0.001); however, no difference was observed between fathers of children with ASD and fathers of TDC (P=0.168). Among parents of TDC, mothers had higher levels of QCST total scores than fathers (P<0.001); however, this difference was not observed in parents of children with ASD (P=0.383). For emotional scores, a significant group × gender interaction was observed ($F_{(1,342)}$=7.37, P=0.007). Results showed a higher level of emotional scores in mothers of children with ASD than in mothers of TDC (P=0.002), while no significant difference was observed between fathers of children with ASD and fathers of TDC (P=0.398). In parents of TDC, mothers had higher levels of emotional scores than fathers (P=0.002); however, this difference was not observed in parents of children with ASD (P=0.431). For insight scores, a significant group×gender interaction was observed ($F_{(1,342)}$=6.80, P=0.010). Results showed a higher level of insight scores in fathers of children with ASD than fathers of TDC (P=0.032), while no significant difference existed between mothers of children with ASD and mothers of TDC (P=0.130). In parents of TDC, mothers had higher levels of insight scores than fathers (P<0.001); however, this difference was not observed in parents of children with ASD (P=0.795). The analysis of assertiveness scores indicated no significant effect of group ($F_{(1,342)}$=1.17, P=0.281), a significant effect of gender ($F_{(2,42)}$=8.90, P=0.003), and no significant group×gender interaction ($F_{(1,342)}$=0.48, P=0.488). For both groups, mothers had higher levels of assertiveness scores than fathers. No significant main effects of group or gender or any group×gender interaction existed for the receiving and listening subscales of QCST (Table 3).

Table 2. Evaluation of the effect of group and gender on BAPQ total scores and its subscales using two-way ANOVA

BAPQ	Mean±SD				Group Effect		Gender Effect		Group×Gender Effect	
	TDC Parents		ASD Parents							
	Father (n=85)	Mother (n=89)	Father (n=76)	Mother (n=96)	$F_{(1,342)}$	P	$F_{(1,342)}$	P	$F_{(1,342)}$	P
Total score	2.97±0.39	2.72±0.45	2.95±0.41	2.90±0.51	2.85	0.092	8.82	0.003	4.28	0.039
Aloof	2.86±0.63	2.53±0.59	2.76±0.64	2.82±0.84	1.68	0.195	3.29	0.071	6.61	0.011
Pragmatic language	2.64±0.54	2.41±0.58	2.66±0.65	2.55±0.61	1.61	0.205	6.79	0.010	0.96	0.327
Rigid	3.40±0.51	3.23±0.57	3.42±0.48	3.34±0.61	1.21	0.272	4.46	0.035	0.55	0.460

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Abbreviation: TDC, Typically Developing Children; ASD, Autism Spectrum Disorder; BAPQ, Broad Autism Phenotype Questionnaire

Relationship between BAPQ and QCST

As presented in Table 4 and Figure 2, for both groups together, a significant negative correlation was observed between BAPQ and the relationship between BAPQ and QCST. As presented in Table 4 and Figure 2, for both groups together, a significant negative correlation was observed between BAPQ and QCST total scores (r= -0.499, P<0.001). Overall, for both total and subscale scores, the BAPQ demonstrated a negative correlation with QCST total score as well as subscale scores of perceptions, emotions, and listening.

4. Discussion

This study aimed to compare communication skills between parents of children with ASD, and parents of TDC. The results were different between the two groups as well as between the fathers and mothers in the two groups. The mean total BAPQ score was higher for mothers of children with ASD than mothers with TDC. In a study of parents, Hurley et al. reported that parents of children with ASD had significant deficiencies in the areas of aloof, rigid personality, and pragmatic language (reduced flexibility, pragmatic language) [15]. The hypothesis of this study is consistent with previous studies but no significant difference was reported. This finding, contrary to the hypothesis of this study, maybe because some parents were influenced by cultural differences

Table 3. Evaluation of the effect of group and gender on QCST total scores and Its subscales Using two-way ANOVA

QCST	Mean±SD				Group Effect		Gender Effect		Group×Gender Effect	
	TDC Parents		ASD Parents							
	Father (n=85)	Mother (n=89)	Father (n=76)	Mother (n=96)	$F_{(1,342)}$	P	$F_{(1,342)}$	P	$F_{(1,342)}$	P
Total score	115.6±7.5	120.6±9.1	117.4±8.1	116.3±8.3	1.94	0.164	4.72	0.030	11.66	<0.001
Perception	32.5±3.1	32.8±3.4	32.6±3.8	31.6±3.4	2.78	0.096	0.90	0.344	3.12	0.078
Emotional	26.8±3.4	28.4±3.6	27.3±3.0	26.9±3.4	2.18	0.141	2.54	0.112	7.37	0.007
Listening	23.9±3.0	24.8±2.9	24.5±3.0	24.3±3.0	0.01	0.909	1.65	0.200	3.18	0.076
Insight	16.0±2.3	17.3±2.2	16.9±2.6	16.8±2.4	0.29	0.591	5.01	0.026	6.80	0.010
Assertiveness	16.3±2.2	17.2±2.1	16.2±2.7	16.8±2.0	1.17	0.281	8.90	0.003	0.48	0.488

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Abbreviations: TDC, Typically Developing Children; ASD, Autism Spectrum Disorder; QCST, Queendom Communication Skill Test

Table 4. Relationship between BAPQ and QCST scores in TDC group, ASD group, and total participants

Groups	Variables	BAPQ Total Score	Aloof	Pragmatic Language	Rigid
TDC group (n=174)	QCST total score	-0.558***	-0.469***	-0.481***	-0.288***
	Perception	-0.448***	-0.287***	-0.498***	-0.217**
	Emotional	-0.492***	-0.460***	-0.392***	-0.233**
	Listening	-0.330***	-0.297***	-0.263***	-0.170*
	Insight	-0.164*	-0.052	-0.187*	-0.136
	Assertiveness	-0.131***	-0.232**	-0.019	-0.065
ASD group (n=172)	QCST total score	-0.435***	-0.249**	-0.400***	-0.308***
	Perception	-0.340***	-0.137	-0.334***	-0.294***
	Emotional	-0.488***	-0.365***	-0.378***	-0.308***
	Listening	-0.258***	-0.204**	-0.222**	-0.124
	Insight	0.090	0.144	0.001	0.031
	Assertiveness	-0.084	-0.043	-0.074	-0.069
Total (n=346)	QCST total score	-0.499***	-0.354***	-0.442***	-0.301***
	Perception	-0.395***	-0.207***	-0.412***	-0.262***
	Emotional	-0.492***	-0.410***	-0.387***	-0.272***
	Listening	-0.292***	-0.245***	-0.241***	-0.147**
	Insight	-0.027	0.059	-0.084	-0.049
	Assertiveness	-0.110*	-0.130*	-0.034	-0.070

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TDC: Typically Developing Children; ASD: Autism Spectrum Disorder; QCST: Queendom Communication Skill Test; BAPQ: Broad Autism Phenotype Questionnaire.

* P<0.05; ** P<0.01; *** P <0.001.

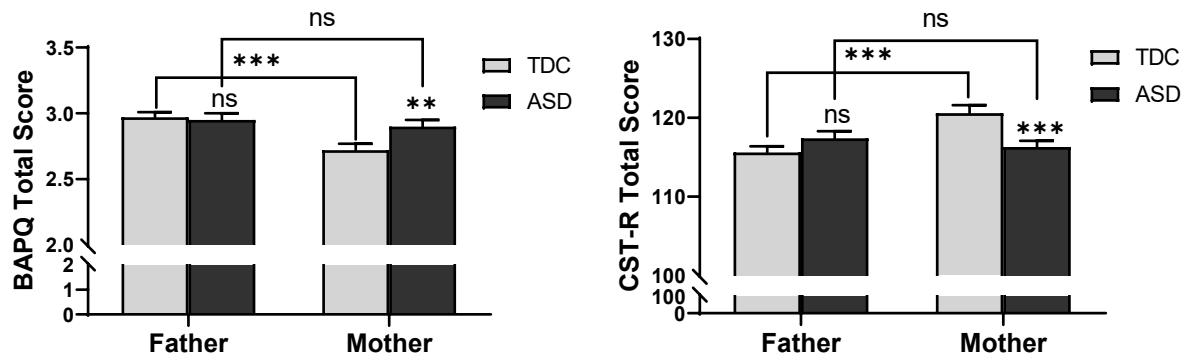

Figure 1. BAPQ and QCST total scores in parents of children with ASD and parents of TDC

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TDC: Typically Developing Children; ASD: Autism Spectrum Disorder; BAPQ: broad autism phenotype questionnaire; CST-R: Queendom Communication skill Test-Revise.

*P<0.05; **P<0.01; ***P<0.001; ns: not significant. Values are presented as mean (SEM).

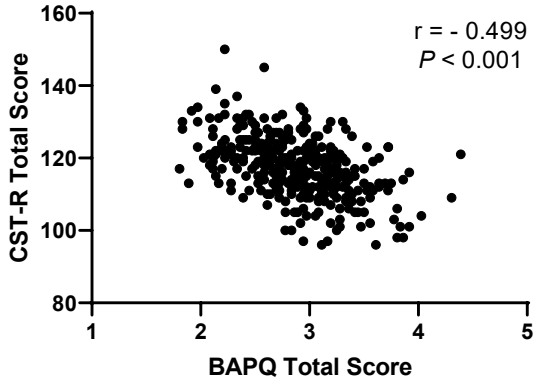

Figure 2. Relationship between BAPQ and QCST total scores in total participants

and self-censorship in response to the questionnaire. In the comparison of fathers and mothers between the two groups, a significant difference is observed in the variable of pragmatic, aloof, and rigid personality which is consistent with previous studies. Piven et al. reported pragmatic problems among mothers and fathers of children with ASD. Mothers had higher functional problems than parents with TDC but fathers did not show different scores than fathers with TDC [24]. Among parents with TDC, mothers received lower BAP test scores than fathers but this difference was not observed among parents of children with ASD. Due to the significant group×sex interaction on aloof scores, the results showed a higher level of aloof scores among mothers of children with ASD than mothers with TDC. In a study by Seidman et al., fathers had a higher aloof score than mothers in the ASD group. In our study, no difference was observed between the parents of the ASD group but mothers with TDC had a lower level of aloof scores than fathers, and no difference was observed between fathers in the two groups. A higher aloof score indicates that the person has broad phenotype characteristics of autism. The effect of gender in the groups on rigid and pragmatic language subscale scores was not significantly different. The mean score of pragmatic language and rigidity in mothers was lower than in fathers [25].

In a study by Joseph Piven et al., results showed that the pragmatic characteristics of parents of children with ASD were poor but the pattern of disability was similar to social and linguistic disabilities and did not match the autism phenotype [24]. Due to the significant interaction between the group and gender on QCST total scores, the relationship between the group and QCST total scores was gender-dependent. The total score of mothers of children with ASD was lower than mothers of TDC but no difference was observed between the two groups in the group of fathers. Mothers in the group with TDC had higher scores than fathers but in the autism group, this difference was not observed between parents. The results show that mothers in the autism group scored higher in emotional scores than the group of mothers with TDC and there was no difference between the two groups of fathers. Wheelwright et al. examined the characteristics of communication skills using self-report and AQ. The study found that parents of children with ASD had more communication problems than the control group [26]. In a study by Mohammadi et al., on social and communication skills in parents of children with ASD, the scale was higher than the control group [22]. In a study by Hurley et al. and Piven et al., a study in a group of families of children with ASD showed that they observed several more social and emotional characteristics in parents of children with ASD. Personality traits, such as inflexibility and isolation were reported as functional problems in key components of the broad autism phenotype in parents of children with ASD [23, 24].

According to Mohammadi's study, the prevalence of autism communication characteristics was higher in men than in women. Rigid and pragmatic features for inclusion in the autism communication traits received higher scores than parents with TDC [6]. A study by Azami et al. showed that mothers of children with ASD have lower control and emotional and communication skills [27]. Insight scores were higher in fathers of children with ASD than in fathers in the normal group but no difference was observed in the group of mothers. In the group of parents with children with TDC, mothers received higher scores than fathers but in the autism group, this difference was not observed between parents. Assertiveness scores reported for mothers were more than fathers in both groups. No significant effect was observed on listening and receiving scores between groups. The difference in scores in these two questionnaires is due to the way they are scored. As in the BAP, in contrast to the QCST, a high score indicates weakness [28]. A negative correlation was observed between the total score and the BAPQ and the QCSTsubscales.

Dawson et al., using the broader phenotype autism symptom scale found that fathers of children with ASD scored significantly higher than mothers in the domains of expressiveness and conversational skills [29]. The comparison of these two questionnaires is not comparable due to the different sub-items and the scoring method. However, the results show that the parents of the autism group are weaker in terms of communication skills than the normal group, it is suggested to use questionnaires that can compare the subscales of the questionnaires in future studies.

5. Conclusion

The present study was conducted as a descriptive study to evaluate the communication skills of parents of children with ASD and parents of TDC. The results of this study showed a difference between parents' communication skills in the two groups, but that some subtests need to be examined more closely was not statistically significant. These differences in some subtests indicated the characteristics of the ASD. Mothers of children with ASD scored higher on communication characteristics than TDC mothers for the broader phenotype autism symptom, and fathers of children with ASD scored higher on autism characteristics than mothers, although the results were not significant, and as in previous studies, parents of children with autism scored higher on the communication characteristics of the ASD. The results show that people with more autism characteristics are more at risk of having an autistic child. More studies are needed in the future.

Limitations

Cultural differences and self-censorship factors existed in individuals' responses to both questionnaires. There was no simultaneous access to both parents because both had to complete the questionnaire. Access to the father was difficult due to his absence from the clinic. Access to normal samples was restricted because they did not visit the clinic.

Ethical Considerations

Compliance with ethical guidelines

The Ethics Committee of Tehran University of Medical Sciences approved this study (Code: IR.TUMS.FNM.REC.1398.136).

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Authors' contributions

All authors equally contributed to preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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