Incidence and risk factors related to anxiety of children and adolescents before elective surgery

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Abstract

The goal of this study was to evaluate the preoperative anxiety in children and adolescents and to identify some of the risk factors associated with the incidence of anxiety in 9–18 years old group. Children and adolescents 9–18 years old hospitalized the night before elective surgeries were analyzed in terms of incidence and severity of anxiety using the State-Trait Anxiety Inventory (STAI) measure. Of the 164 patients, 111 (67.6%) suffered from preoperative anxiety. The incidence of anxiety in children aged 9–12 was 2.88 times the anxiety of those aged 12–18 (OR = 2.88) (1.65, 5.98). Moreover, the incidence of anxiety in only children was 0.65 times that of children with siblings (OR = 0.78) (0.11,2.93) , and in patients with a history of hospitalization, the incidence was 1.85 times the stress in children without hospitalization history (OR = 1.85)(1.31,3.99); finally, the incidence of anxiety in children of higher socioeconomic status was lower compared with those of lower socioeconomic status (OR = 0.13) (0.08,0.35). Having close frend or family in the healthcare staff decreased the prevalence (OR = 0.64 (0.23,1.79) and severity of anxiety (47.02 ± 5.48 vs. 54.18 ± 7.18) (P-value = 0.001). There was no relationship between gender and the incidence of anxiety (OR = 1). Incidence of preoperative anexiety in foriner was1.72 times of persion patients (OR=1.72) (0.99,4.25). The severity of anxiety was lower in boys (46.22 ± 6.68) compared with girls (52.55 ± 7.52) (P-value = 0.002) and lower in patients of medium-to-high socioeconomic status (43.64 ± 5.45) compared with those with lower socioeconomic status (49.66 ± 6.49) (P-value = 0.003). There was no relationship between being an only child and severity of anxiety (P-value = 0.54) (48.31 ± 5.05 vs. 48.12 ± 6.81). However, anxiety was more severe in patients with a history of hospitalization (50.55 ± 4.64) (49.2 ± 6.23) (P-value = 0.09). Severity of anexiety was not dependent to nationality of patients(P-value = 0.6) .Taken together, our data suggest that various methods should be used to reduce anxiety and associated complications, regarding the high prevalence of anxiety in mentioned groups of children and adolescents.

Key Words: Anxiety; surgery; children and adolescents.

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Over the past two decades, severe acute respiratory preoperative anxiety is inevitable.[1] It is proven that an increase in preoperative anxiety levels can lead to psychological and physical complications, affect the quality of anesthesia and postoperative care, and increase mortality rates.[2] Anxiety depends on several factors, including trust in the hospital, awareness of the method and complications of the surgery and anesthesia, and the patient's age.[3] Different studies have reported various incidence rates for anxiety ranging from 25% to 80%.[4,5] Children are probably more prone to anxiety considering their less developed cognitive and communicative capabilitie.[6] When entering the operating room and being separated from their parents, this anxiety peaks and leads to uncooperative behaviors regarding anesthesia induction.[7] Some studies have reported a prevalence of preoperative anxiety up to 70% in children and adolescents.[8] Children who suffer from preoperative anxiety are more than three times as much at risk of postoperative anxiety and pain.[9] Moreover, it has been observed that children and adolescents who experience severe preoperative anxiety will suffer from psychological complications such as sleep disorder and

separation anxiety disorder (SAD).[10] If left uncontrolled, anxiety can contribute to the lengthening of hospitalization time and interfere with the wound healing process.[11] Recent studies have indicated that controlling preoperative anxiety in children before school age can prevent postoperative delirium (POD).[12] So far, different tools have been introduced for the analysis of preoperative stress in children and adolescents, among which the State-Trait Anxiety Inventory (STAI) is known as the golden standard to analyze the anxiety resulting from depressive syndromes. This test is designed to be employed in children and adolescents in middle school and high school and consists of two 20-item scales. STAI scores are typically classified into categories of "mild anxiety" (20–37), “moderate anxiety” (38–44), and “severe anxiety” (45–80).[13] After detecting anxiety, various methods, such as pharmacotherapy[14] and music therapy, can be used to control preoperative anxiety.[15] Preoperative visits[16] and sedatives are other methods used.[17] The present study was conducted considering the significance of preoperative anxiety in children and adolescents, to identify some of the risk factors associated with the incidence of anxiety in these age groups.

Material and Methods

This prospective cross-sectional study was approved in reaserch council of Kerman university of medical sciences (IR.KMU.AH.REC.1400.312) and conducted from March 21, 2020 to March 20, 2021.

In children under 7 years of age, written consent was obtained from the child's legal guardian and simple explanations were provided in order to obtain the child's consent and in children aged 7-15 years, consent was obtained from both the child and the legal guardian. The stress levels of children and adolescents aged 6–18 who were candidates for surgery in Kerman University of Medical Sciences teaching centers and were hospitalized the night before surgery were assessed using the State-Trait Anxiety Inventory in terms of incidence and severity of anxiety.

Moreover, demographic information of patients and their families, including age, gender, being an only child, socioeconomic status of the family, history of hospitalization and surgery, and presence of a close relative in the medical team, was collected using a questionnaire. The acquired data and risk factors associated with stress in the patients were analyzed using SPSS 24 (SPSS, Inc., Chicago, IL, USA), multi-variable logistic regression and paird T-test.

Results

One hundred and sixty-four children and adolescents aged 9–18 (including 84 boys and 80 girls) who were candidates for surgery under general anesthesia were studied the night before the surgery. The mean age of the patients was 12.66 ± 5.24. In total, 111 (67.6%) of the patients were found to be experiencing anxiety before the surgery (95% CI: 58.44, 71.32). The relationship between preoperative anxiety and other factors, including age, gender, socioeconomic status, history of hospitalization and surgery, being an only child,and the nationality of patents was assessed (Table 1). It was revealed that the prevalence of anxiety in children aged 9–12 was 2.88 times those aged 12–18

Table 1. *Relaton between agitation and demographics of the patients.*

Variables		Total	Agitate	Non agitate	OR(95% CI)	
		NO= 164	111(67.6%)	53 (32.4%)	COR(95% CI)	AOR(95% CI)
Sex	Male	84(51.2%)	53(47.7%)	31(58.4%)	1	
	Female	80(72.5%)	48(52.3%)	32(41.6%)		
Age	9-12	75(45.8%)	52 (46.8%)	18(33.9%)	2.06(1.65,5.98)	2.88(1.98,6.22)
	12-18	89(54.2%)	49(44.2%)	35(66%)		
Single child	Yes	58(35.3%)	33(29.7%)	25(47.1%)	0.47 (0.09,2.66)	0.78 (0.11,2.93)
	No	106(64.7%)	78(70.3%)	28(52.8%)		
Previous surgery or hospitalization	Yes	72(43.9%)	51(45.9%)	21(39.6 %)	1.29 (1.28,3.77)	1.85 (1.31,3.99)
	No	92(56.1%)	60(54.1%)	32(60.3%)		
Socioeconomic status	Moderate to high	66(40.2%)	26(23.4%)	40(75.4%)	0.09 (0.06,0.32)	0.13 (0.08,0.35)
	Low	98(59.8%)	85(76.6%)	13(24.6%)		
Close family of the treatment staff	Yes	41(25%)	21(18.9%)	20(37.7%)	0.38 (0.11,1.66)	0.64 (0.23,1.79)
	No	123(75%)	90(81.08%)	33(62.2%)		
Nationality	Foreign	55(33%)	39(35%)	16(30%)	1.25(0.94,3.56)	1.72(0.99,4.25)
	Persian	109(77%)	72(65%)	37(69.8%)		

The relationship between demographic indicators and the severity of patients' anxiety was assessed based on STAI

(OR = 2.88) (1.98, 6.22). There was an inverse relationship between being an only child and the prevalence of anxiety, with the incidence of anxiety in only children 0.38 times that of children with siblings (OR = 0.78)(0.11, 2.93). Patients who had a history of surgery or hospitalization experienced anxiety 2.85 times those who did not (OR = 1.85)(1.31, 3.99). The prevalence of preoperative anxiety in those with higher socioeconomic status was significantly lower compared with those from families of low socioeconomic status (OR = 0.13) (0.08, 0.35). The results of the present study proved that having a close relative in the medical team decreased the prevalence of anxiety in patients, and the incidence of stress in those with close relatives in the medical team was 0.38 those without close relatives in the team (OR = 0.64) (0.23, 1.79). In the present study, 47.7% (53) of the anxious patients were boys, and 52.3% (58) were girls. Moreover, there was no relationship between gender and the incidence of preoperative anxiety (OR = 1). Of the 164 patients, 67.6% (111) experienced anxiety the night before the surgery, 53 (47.7%) of whom were boys, and 48 (52.3%) were girls. The mean age of these patients was 12.66 ± 6.8, and 75 (45.8%) and 89 (54.2%) were in the 9–12 age group and 12–18 age group, respectively. Of the 111 patients with anxiety, 51(45.9%) had a history of surgery or hospitalization, and 60 (54.1%) did not have any history of surgery or hospitalization. 33(29.7%) of 58 single childs experienced anxiety before the surgery, while 25(47.1%) of whom did not experience any anxiety. The ratio of anxiety incidence in only children to anxiety incidence in children with siblings was 0.38 (95% CI: 0.78) (0.11, 2.93), indicating a lower level of anxiety in this group. 26 of 66 patients with modrate to high socioeconomic status had pereoperative anexiety wihle 40 of them hadnot.from 98 patients of low socio-economic family 85 patients experiented anexiety and 13 hadnot. (95% CI: 0.13) (0.08,0.35). 41 patients had at least one close relative in the medical staff team; of theme, 21 (18.9%) experienced anxiety, and 20 (37.7%) did not.out of 123 patents without any close relative in the medical staff team ,90 were agitated and 33 were relaxed. (95% CI: 0.64) (0.23,1.79) score (Table 2). The mean of anxiety severity in the patients was 49.33 ± 5.62 according to the STAI measure, which is considered moderate to severe score. The analysis of age showed that the severity of stress in children in the 9–12 age group and those in the 12–18 age group was 53.09 ± 7.62 and 48.87 ± 5.26, respectively, and that the difference was statistically significant (*P*-value = 0.001). The severity of stress among boys was 46.22 ± 6.6, which was significantly lower than girls (52.55 ± 7.52) (*P*-value = 0.002). There was no relationship between being an only child and the severity of stress (*P*-value = 0.54); the severity of stress in only children and children with siblings were 48.31 ± 5.05 and 48.12 ± 6.81, respectively. The incidence of stress in patients with a history of surgery or hospitalization was higher compared with the others; however, the severity of stress in this group and in those without a history of surgery or hospitalization was 50.55 ± 4.64 and 49.2 ± 6.23, respectively, with a difference that was not statistically significant (*P*-value = 0.09). The severity of stress in patients of middle to high and low socioeconomic status was 43.64 ± 5.45 and 49.66 ± 6.49,

Table 2. *State anxiety of the patients (STAI) in relation to thire demographics..*

Variables		STAI score	*P-value*
Sex	Male	46.22 ± 6.68	0.002
	Female	52.55 ± 7.52	
Age	6-12	53.09 ± 7.62	0.001
	12-18	48.87 ± 5.26	
Single childe	Yes	48.31 ± 5.05	0.54
	No	48.12 ± 6.81	
Previous surgery or hospitalization	Yes	50.55 ± 4.64	0.09
	No	49.2 ± 6.23	
Socioeconomic status	Moderate to high	43.64 ± 5.45	0.003
	Low	49.66 ± 6.49	
Close family of the treatment staff	Yes	47.02 ± 5.48	0.001
	No		
Nationality	Foreign	51.46 ± 6.38	0.6
	Persian	50.51 ±5.82	

respectively, with a severity significantly higher in the latter group (*P*-value = 0.003). Patients with a relative in the medical team experienced lower anxiety levels, with a mean severity of 47.02 ± 5.48 compared with 54.18 ± 7.18 in other patients (*P*-value = 0.001). There was no significant difference in stress intensity between Iranian (50.51 ± 5.82) and foreigner (51.46 ± 6.38) patients (*P*-value = 0.6).

Discussion

The incidence of anxiety before medical treatment is often an inevitable phenomenon in children, leading to numerous problems in patients and their families. The present study results showed that the incidence of anxiety in children and adolescents under 12, those with low socioeconomic status, and those with a history of hospitalization or surgery was higher. On the other hand, only children and patients with a close relative in the medical team experienced a lower incidence of anxiety. Moreover, there was no relationship between the incidence of anxiety and gender. The severity of anxiety was higher in girls under twelve, those with a history of hospitalization, and those with a low socioeconomic status. Moreover, the severity was significantly lower in patients with a close relative in the medical team. On the other hand, there was no relationship between being an only child and the severity of anxiety. Of the 164 patients aged 6–18 who were candidates for surgery and were hospitalized the night before surgery, 111 (67.6%) experienced anxiety. In the study conducted by Getahun et al.[18], 75%, and in the study conducted by Chow et al.[19] in 2015, 50–70% of the children and adolescents were anxious before entering the operating room. Unlike these studies in which anxiety was assessed in the operating room, the present study analyzed the patient the night before the surgery. However, the present study results are in line with these studies, demonstrating the presence of anxiety hours before the surgery. In the study conducted by Sadegh Tabrizi et al., the severity of anxiety in children aged 8–10 the night before and in the morning of the surgery day was 32 ± 6.5 and 34.1 ± 6.7, respectively.[20] However, the total severity of anxiety in the present study was 49.33 ± 5.62, which was higher than Tabrizi's study. In the study conducted by Li and Lam on children aged 7–12, the mean score of preoperative anxiety was 77.38 ± 52.7,[21] significantly higher than the present study. The study conducted by Erkilic et al. reported that the level of preoperative stress in Turkish adult patients was higher than the average (40.6 ± 8.5).[22] However, the present study was conducted on children and adolescents, and therefore, the severity of stress (49.33 ± 5.62) was also higher than average. Analyses indicated no relationship between the incidence of anxiety the night before the surgery and gender, which is in line with other studies (Getahun AB).[18] However, in the study conducted by Erkilic et al., the incidence and severity of stress in adult women was higher than in adult men.[22] Likewise, in the present study, the severity of anxiety was significantly higher in girls.

In the study conducted by Sari et al. on 70 children aged 6–12 before surgery, no difference was observed between anxiety levels in girls and boys.[23] Moreover, Akca SO. did not find any significant difference between anxiety levels in boys and girls aged 6–12. These results are in line with the results of the present study.[24] Various studies have revealed that children of younger ages experience more anxiety. However, in most of these studies, patients were evaluated just before the surgery and at the time of separation from their parents, which justifies the high anxiety levels in the children. However, the present study examined the patients on the night before the surgery while at least one parent was with them. It seems that being away from home is the cause of the anxiety, and older patients overcome this stress due to their cognitive development. In the study conducted by Charana et al., being an only child was introduced as a fundamental risk factor of increased anxiety in parents and children before the surgery.[25] One possible reason for this can be that these patients do not have the opportunity of sharing their emotions with a sibling; nevertheless, more research is needed in this regard. Nonetheless, in the present study, only children had lower levels of anxiety the night before the surgery (OR = 0.38) (95% CI: 0.11, 0.73), which could be due to the presence and reassurance of both parents. In this regard, the study conducted by Hussain et al. also indicated that the presence of parents in the preoperative holding area could calm and reassure the children and lead to better cooperation by them; however, there was no relationship between being an only child and anxiety.[26] However, the present study revealed that only children, who have all their parents' attention and support, experienced lower levels of anxiety while having siblings led to the absence of one of the parents and possibly an increase in anxiety in the patient. The study conducted by Pulsawat et al. on 100 boys revealed that previous anesthesia anxiety, the number of anesthesia experiences, and children's age were associated with preoperative anxiety. Pulsawat et al. believed that we should prepare children by using all resources and personnel with a family-centred approach and providing appropriate information to create a positive experience of surgery for them.[27] Anesthesiologists are most likely at the forefront of this multifaceted effort.[28] In the study conducted by Perry et al., it was reported that 50–75% of the children experienced preoperative anxiety, and adequate preparation of these children could prevent the behavioral and physiological manifestations of anxiety.[8] They also concluded that children were more prone to preoperative psychological pressures due to limited cognitive capabilities, dependence on others, inadequate ability to control their emotions, and inadequate understanding of the healthcare system. In the study

conducted by Vagnoli, it was observed that children with a history of hospitalization and surgery experienced more anxiety.[28] Moreover, the study conducted by Davidson et al. in 2006 indicated that patients with a history of surgery suffered from higher levels of preoperative anxiety.[29] In most of these studies, the reason for anxiety was a previous experience of postoperative pain or light anesthesia. In contrast, in other studies, patients who had previously experienced ideal anesthesia, proper pain control, and surgeries without complications did not experience preoperative anxiety.

The results of the present study indicated that the incidence of anxiety in children with a history of hospitalization and surgery was higher (AOR = 2.85) (95% CI: 1.31, 2.99), while the severity of anxiety was not higher in this group (50.55 ± 4.64 *vs.* 49.2 ± 6.23) (*P*-value = 0.09). The study conducted by Fortier et al. found that rural parents and those with low education experienced more anxiety, and they transferd this anxiety to their children.[30] Other studies reported that parents with higher levels of education experienced more anxiety; for instance, in the study conducted by Caumo et al., it was observed that the level of education and knowledge had a direct relationship with the incidence of stress.[31] The study conducted by Domar et al. revealed a relationship between parents' educational background and their anxiety level. The anxiety could be reduced even in families with low levels of education by providing proper explanation and increasing their knowledge.[32] In the study conducted by Chutima et al., parents with lower levels of education experienced higher levels of anxiety, which can be due to their lack of information. Participants who benefited from adequate social support (AOR = 0.16) (84% CI: 0.07, 0.34) experienced less anxiety compared with those who had poor social support. The results of Roomruangwong's study were in line with studies conducted in Addis Ababa,[33] and Thailand, showed that preoperative anxiety was higher in patients with poor social support compared with those who received adequate social support. The study conducted by Erkilic et al. reported that the severity of anxiety was significantly higher in patients at younger ages, female patients, and those who had experienced sleep disorders the night before the surgery. However, with an increase in the level of education of the family, the severity of anxiety decreased in children ($P < 0.001$ and r = -0.261).[22] The results of Erkilic's study are quite similar to those of the present study since the present study also proved that the severity of anxiety was significantly higher in girls, patients at younger ages, and those with lower socioeconomic status. the study conducted by Srahbzu et al.[34] showed the prevalence of anxiety was related to gender (female), social support, and severity of pain after orthopedic trauma. Also, unlike in our study, anxiety was higher in females. Like our results, anxiety was more common in the low socioeconomic group. It was studied in post orthopedic trauma adults, while we examined anxiety in children the night before surgery, which explains the difference in results.

it was observed that visits by the surgeon on the night before the surgery and reassuring the patients can be effective in reducing their anxiety. Moreover, the study conducted by Jafar et al.[35] reported that meeting the anesthesiologist before the surgery and discussing the anesthetic procedure and pain control methods calmed the patients. In the present study, the effect of preoperative visits on anxiety was not assessed; however, since previous studies have mentioned preoperative visits as a potential factor in reducing anxiety in patients and their families through reassuring them and providing information on the methods of surgery and anesthesia, the presence of a close relative in the medical team can have a similar effect on reducing anxiety and reassuring the patients and their families; the presence of a relative in the medical team led to a decrease in the prevalence and severity of anxiety in the patients in the present study. Our results showed that foreign patients, mostly Afghans, were more prone to preoperative stress than Iranians, which may be due to their less knowledge of the type of surgery and their less trust in the medical staff. There was no significant difference in stress intensity between Iranian and foreigner patients.

In conclusion, the present study suggest that planning for identification of patients at high risk of preoperative anxiety and employing all the resources and practical strategies to reduce their anxiety seems crucial.

List of acronyms

OR - odds ratio
POD - post operative delirium
STAI - State-Trait Anxiety Inventory

Contributions of Author

All authors contributed to the design and implementation of the research, to the analysis of the results, and to the writing of the manuscript. All Auhthors approved the final edited typescript

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Conflict of Interest

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