

A Persian Translation of “Brief Infant Sleep Questionnaire Revised (BISQ-R)” for Assessment of Sleep in Infants and Toddlers: A Pilot Study

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Abstract

Background: Sleep is important in promoting optimal growth, health, and well-being while providing the highest opportunity for effective functioning in children. The high prevalence of sleep problems and their negative outcomes for children and parents reflect the need to design early screening tools that parents or professionals can use to assess sleep problems in the first 3 years of life. This study aimed to assess the reliability and validity of the Persian version of the Brief Infant Sleep Questionnaire-Revised (BISQ-R).

Method: The study used the standard method of questionnaire translation and back-translation from Persian to English. After sending the final version to the original author for approval, 10 experts evaluated the validity of the questionnaire using both quantitative and qualitative methods, and 20 parents of children commented on the reliability of the questionnaire. Twenty hospitalized children with a diagnosis of pneumonia and their mothers participated in the study.

Results: Moderate and high correlations (0.41-0.88) and significant relationships ($P < 0.05$) were found between the items of the pre-test and post-test questionnaires. There were no statistically significant differences ($p > 0.05$) between the pre-test and post-test scores of the BISQ-R instrument (paired t-test), showing similar results in two consecutive tests that confirmed the stability of BISQ-R and its test-retest reliability.

Conclusion: According to the results, the Persian version of the BISQ-R questionnaire has acceptable validity and reliability; therefore, this questionnaire is a valid and reliable instrument to assess children's sleep and can be used for children aged 12 to 36 months in different environments.

Key Words: Child, Infant, Sleep, Toddlers.

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1- INTRODUCTION

Sleep is a common concern for parents of infants and toddlers, with 25-30% of parents reporting that their child has trouble sleeping (1-3). Resistance to falling asleep and waking up during sleep are prevalent in 25% to 30% of toddlers, and nocturnal sleepwalking is seen in up to 50% (4). Especially, when children with trouble sleeping for at least a short period become ill (5), they try to sleep in a new environment that may not meet their sleep needs during hospitalization. Loud noises, warnings, and frequent routine visits by nurses may make it difficult for children to sleep. In addition, sleep deprivation may result from stress or anxiety of being hospitalized (6).

Total sleep time in toddlers reduces only slightly during the second year, averaging about 11 to 12 hours. Most toddlers take a nap daily and many give up by the end of the second or third year (5). Although toddlers are usually less likely to wake up at night than neonates, most children in this age group have at least one night a week awakening. The child's ability to return to sleep independently and without the presence of parents determines how problematic this nocturnal wakefulness is (6).

Studies have shown that insufficient or disrupted sleep is a risk factor for high blood pressure, high blood cholesterol, insulin resistance, and obesity. Children who do not get enough sleep at night may be more prone to illnesses such as colds. Overall, physicians have to pay attention to the inadequate sleep of children of all ages to enhance optimal growth, health, and well-being, as well as to provide children with the greatest chance of effective functioning at home and school (6). Research has also shown that parental behaviors affect toddlers' sleep. For example, studies have shown that the presence of parents during sleep is strongly associated with an increase in sleep

disorders, and changes in parental behaviors improve sleep disorders in infants and toddlers (6).

The high prevalence of sleep problems, their negative outcomes for infants and their parents, and the high success of clinical and educational interventions highlight the need for primary screening tools used by parents or professionals to assess sleep problems in the first 3 years of life (7).

The Brief Infant Sleep Questionnaire (BISQ) is one of the instruments for measuring children's sleep status, assessing sleep patterns, parental perceptions, and sleep-related behaviors in toddlers up to 36 months in the past week (7).

More than 50 studies have used the questionnaire since the publication of the first case by Sadeh in 2004. The questionnaire includes the extended main questionnaire (BISQ-R), consisting of a broader array of sleep behaviors and outcomes. This questionnaire has been translated into more than 20 languages and validated against actigraphy (7-10).

Since the behaviors of parents and hospitalization affect the quality of children's sleep, it is necessary to pay special attention to the sleep of toddlers, particularly when hospitalized. Hence, it is necessary to study and evaluate sleep in these children with appropriate instruments to examine their sleep status and create quality sleep in children. To the best of our knowledge, the validity and reliability of the BISQ-R questionnaire have not been examined in Iran; therefore, the present study aimed to evaluate the validity and reliability of the BISQ-R questionnaire in children aged 12 to 36 months.

2- METHOD

This is a descriptive-analytical cross-sectional study conducted on a sample of children aged 12 to 36 months who were referred to the hospital and their mothers.

The sample size was estimated to be 20 participants, and since sleep disorders in hospitalized infants with respiratory diseases are more (11, 12), the samples were selected based on the inclusion criteria of being in the age range of 12 to 36 months, spending their first day of hospitalization with a diagnosis of pneumonia in the hospital, and not receiving specific drugs for sleep problems.

Data were collected from December 21, 2020, to May 2021 using the BISQ-R short form. Short form The instrument has been developed by Mindell et al. to include a wider range of sleep behaviors and outcomes that assess sleep patterns, parental perceptions, and sleep-related behaviors in toddlers up to 36 months in the past week of evaluation. This questionnaire examines 1) the nocturnal sleep duration (between 7 pm and 7 am); 2) daytime sleep duration (between 7 am and 7 pm); 3) the number of night awakenings; 4) wakefulness during the night hours (10 pm to 6 am); 5) nocturnal sleep onset time (the time when the child falls asleep at night); 6) sleep onset latency; 7) sleeping method; 8) sleeping place; 9) age of the child; 10) sex of the child; and 11) the role of the respondent (who completed the BISQ-R) and asks parents to report their child's sleep behavior in the last week (7, 8). This study measured the total length of sleep by adding the duration of the night and daily sleeps and then subtracting the duration of waking up at night from the total. Besides, the mean daily sleep per week was calculated considering the duration of daily sleep. After obtaining permission from the author of the questionnaire, two Persian and English translators performed the translation process separately based on the Brussels translation/back-translation model (13). Then, the original author received the final version of the questionnaire for approval.

The study included three psychometric stages. First, interviews with 10 experts (one pediatric psychiatrist, four pediatric nursing faculty members, three ward nurses and two pediatricians) using both quantitative and qualitative methods aimed at examining the face validity of the questionnaire. Hence, the experts were supposed to check the questionnaire regarding convenient comprehension, grammar, and style of writing the items. They were expected to comment on the importance of each item on a five-point Likert scale (from absolutely important=5 to not at all=1) from a qualitative perspective. Items whose item impact score was >1.5 were retained in the questionnaire (14, 15). The content validity was examined in the second stage by the content validity index (CVI) and content validity ratio (CVR). Following the Waltz and Basel method, 10 experts commented on each item in terms of simplicity, fluency, relevance, and transparency based on a four-point Likert scale to evaluate the CVI. According to the acceptance criterion of the item after calculating the CVI, if the CVI score for each item is > 0.79 , that item will be suitable. If the score is between 0.7-0.79, it needs modifications, and if the score is <0.7 , that item is not acceptable and should be removed. The mean CVI of all items was calculated to determine the CVI of the whole instrument, while 0.79 was the acceptance criterion (16). Also, the 10 experts commented on the necessity of each item based on the three-point Likert scale (from necessary=3 to not necessary=1). The Lawshe formula was used to calculate the CVR. Given that the number of specialists was 10, the acceptable rate of CVR was considered 0.62 based on the Lawshe table (17).

The third stage involved determining the internal consistency of the questionnaire, which was performed with the participation of 20 toddlers and their mothers using Cronbach's alpha

coefficient. The acceptable coefficient to confirm the internal consistency of the questionnaire was ≥ 0.7 . The fourth stage assessed the external reliability of the questionnaire using the test-retest method with the participation of 20 toddlers and their mothers at one-week intervals, after which Pearson correlation coefficient (r) was used to confirm the repeatability of the questionnaire. In this method, if Pearson correlation coefficient values (r) are greater than 0.5, the questionnaire will be more reliable (18).

Descriptive and inferential statistics, including mean, standard deviation, and Cronbach's alpha, were used to analyze the data. Pearson correlation coefficient and paired t-test were used to compare the mean of sleep measurements and determine the reliability of the retest. All statistical calculations were performed using SPSS16 software, and the maximum accepted error was 5% in all tests.

2-1. Ethical Considerations

Written permission to translate BISQ-R was obtained from Dr. Jodi Mindell via email (personal contact) study@babysleep.com. The researcher received the code of ethics from the ethics committee of Isfahan University of Medical Sciences with the ID of IR.MUI.RESEARCH.REC1399.1360 and written permission from the School of Nursing and Midwifery of Isfahan University of Medical Sciences to collect the required data. Then the researcher referred to the selected hospitals, presented the letter of recommendation, explained the objectives of the research to the center officials, and obtained their consent and cooperation. Selection of the samples meeting the conditions for inclusion in the study and inviting the parents to participate in the research were the next steps. Written informed consent was obtained from the child's guardian or legal guardian after providing sufficient information to the units participating in the investigation to

comply with the ethical standards. The researcher considered the confidentiality of information throughout the research process.

3- RESULTS

The mean age of the children participating in this study was 24.5 ± 3.01 months, of whom 65% were boys, and 35% were girls. 80% of them were term children and 20% were preterm infants. The mean age of mothers was 29.075 ± 3.42 . The majority of mothers and fathers of children participating in the study had a diploma or lower levels of education.

Through the phase of qualitative face validation, the necessary changes were applied through discussion among the experts. As for the quantitative validation, the item impact scores were calculated varying from 0.65 to 1, leading to the retainment of all items in the questionnaire. CVI scores for assessing the content validity ranged from 0.7 to 1. Items with a CVI score of 0.7- 0.79 required modifications. The total CVI score was 0.79, and the total CVR score was 0.79 in determining the content validity. Cronbach's alpha was 0.853 for internal reliability. A pre-test and post-test were performed to measure the external reliability of the instrument (test-retest). The Pearson correlation coefficients in three subsets of infant sleep, parental perception, and parental behavior were $r=0.6$, 0.866, and 0.5, respectively; and $r=0.76$ in total. (**Table 1**). As shown in **Table 1**, there were positive moderate to strong correlations between infant sleep ($p=0.003$), parent perception ($p=0.000$), parent behavior ($p=0.079$), and the overall score ($p=0.014$) between the pre and post-tests. All correlations were significant at the level of $p < 0.000$ ($\alpha=0.01$).

The results of the analysis reflected the differences between some of the measurements by BISQ-R in the pre-test

and post-test. Settling time was longer in the pre-test than in the post-test. Mothers reported lower numbers of night waking in the post-test than in the pre-test. Nocturnal sleep duration obtained lower scores in the post-test than in the pre-test. The daytime

sleep durations were higher in the post-test than the pre-test. Also, no statistical differences were found between the means of pre-test and post-test of sleep-onset time, nocturnal wakefulness, and total sleep duration (**Table 2**).

Table-1: Correlations between the pretest and posttest scores in the three main domains of BISQ-R

	Mean (SD)		Paired t test		Correlation	
	before	after	t	P	r	p
Infant sleep	56.88 (10.44)	60.38 (20.52)	-0.699	0.493	0.698	0.003
Parent perception	57.18 (7.57)	58.15 (8.57)	-0.486	0.633	0.869	0.000
Parent behavior	56.36 (12.398)	57.38 (18.7)	-0.192	0.849	0.402	0.079
Overall score	56.37 (7.955)	56.70 (8.23)	-0.192	0.850	0.542	0.014

Table-2: Correlations between the pretest and posttest scores in the subscales of BISQ-R

	Mean (SD)		Paired t test		Correlation	
	Pre-test	Post-test	t	P	r	p
Daytime sleep duration (hour)	1.9 (.9)	2.05 (1.09)	-0.547	0.591	0.602	0.006
Settling time (hour)	2.6 (1.14)	2.8 (1.10)	-1.285	0.214	0.809	0.000
Night awakenings (rate)	2.1 (.78)	2 (.85)	0.698	0.494	0.700	0.001
Nocturnal sleep Duration (hour)	7.3 (2.05)	6.5 (1.67)	1.758	0.112	0.416	0.068
Nocturnal wakefulness (min)	20.50 (8.41)	19.25 (4.55)	0.962	0.353	0.743	0.000
Sleep-onset time (min)	31.25 (22.29)	23 (16.65)	1.680	0.109	0.616	0.008
Total sleep time	9.2 (2.39)	8.55 (1.7)	0.508	0.205	0.882	0.000

Pearson correlation was used for correlating the pre-test and post-test results. There were positive moderate to strong correlations in nocturnal sleep duration ($r=0.416$), daytime sleep duration ($r=0.602$), number of night wakings ($r=0.700$), duration of nocturnal wakefulness ($r=0.743$), nocturnal sleep-onset time ($r=0.616$), the settling time ($r=0.809$), and the total sleep time ($r=0.882$) between the pre and post test scores (**Table 2**).

All correlations were significant at the level of $p < 0.000$ ($\alpha=0.01$). The results were compared using paired sample t-tests to evaluate whether there was a significant difference between the mean scores of the BISQ-R pre-test and post-test; and no

significant difference was found between the pre-test and post-test measurements.

4- DISCUSSION

According to the review of literature conducted by the researcher there has been no reliable instrument to assess the sleep of toddlers in Iran. Thus, the present study attempted to translate the BISQ-R questionnaire, developed by Mindell et al. and translated and psychoanalyzed in different languages.

The psychoanalysis results of this study showed that the Persian version of the BISQ-R questionnaire has acceptable validity and reliability; therefore, this questionnaire is a valid and reliable instrument to assess the sleep of infants

and toddlers and can be used for children aged 12 to 36 months in different environments.

An instrument is stable when the same scores are obtained for different people in different conditions (19). Pre-test and post-test methods evaluate the stability of the instrument. In this study, the mothers completed BISQ-R twice with a one-week interval, after which the scores were compared. Reliability coefficients obtained from pre-test and post-test evaluation were at the range of 0.88 to 0.41 (**Table 2**). The higher the value, the more reliable (stable) the instrument is, indicating moderate to strong correlations at the level of $\alpha=0.01$ ($p < 0.000$) and the stability of mothers' responses in completing the tests and reporting sleep characteristics and problems of children. This shows that the Persian version of BISQ-R has good validity and reliability to screen sleep problems in infants and toddlers.

In his study, Sadeh (2004) found a strong and significant correlation (0.38-0.95) between repeated measurements of the BISQ instrument (7). Comparing the correlation coefficients of the Persian version of BISQ-R in the pre-test and post-test with the values reported by Sadeh shows that correlations reported for the original version (see 7) were stronger than those found for the Persian version, in the present study. The number of samples, mothers' education level, cultural background, and mothers' morale can be factors influencing the difference in correlation with the original version. In the Turkish version, a correlation of 0.35 to 0.85 was reported, which is almost the same as those in the present study (20).

Pearson correlation was used for the BISQ-R pre-test and post-test. There were positive moderate to strong correlations between nocturnal sleep duration ($r=0.416$), daytime sleep duration ($r=0.602$), number of night wakings ($r=0.700$), duration of nocturnal

wakefulness ($r=0.743$), nocturnal sleep-onset time ($r=0.616$), the settling time ($r=0.809$) and total sleep time ($r=0.882$). In the Turkish version, there was a strong correlation between nocturnal sleep duration ($r=0.85$), daytime sleep duration ($r=0.85$), number of night wakings ($r=0.83$), duration of nocturnal wakefulness ($r=0.63$), nocturnal sleep-onset time ($r=0.75$), settling time ($r=0.35$), and total sleep duration ($r=0.49$) as in the present study. The total CVR score was 0.79 in determining the content validity. The Turkish version reported the values of 0.89 to 1 (19). Also, in a Spanish study, there was a high correlation between the two-time points in the general questionnaire ($r=0.848$) and all subscale scores (9). The present study also found relatively moderate to strong correlations between the sub-scales of infant sleep, parent perception, parent behavior, and overall score of the BISQ-R instrument, confirming the reliability of the Persian version of this questionnaire as compared to the original one.

Different factors such as personality, beliefs, expectations, feelings, and behaviors of parents influence the sleep of children (7). Meantime, cultural and environmental factors, including socio-cultural beliefs, socioeconomic factors and values, media impacts, and physical conditions are also associated with children's sleep problems; thus, considering these factors can be effective in matching or incompatibility in the correlation of sleep tools in different studies (20).

One limitation of our study is the relatively small sample size, which of course, suffices to get statistically significant values in the analysis of psychometric properties. Besides, we conducted the study in one population and context, which means that there is the possibility of obtaining different results in other populations and locations. However, given

that the age group of the questionnaire was the same, and there were moderate to strong correlations, it would probably be applicable in other environments as well.

5- CONCLUSION

The results showed that the BISQ-R Persian version, including 20 items, 3 main domains, and 6 sub-factors, is a valid and reliable instrument to assess children's sleep and can be used for children aged 12 to 36 months. The questionnaire will also help physicians, nurses, and parents evaluate their educational, supportive, and treatment programs based on the results of the child sleep questionnaire.

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7- CONFLICT OF INTEREST

None.

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