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Habitual Sugar Intake as a predictor of Sleep Quality among Emerging Adults

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Abstract: *T*he present study is aimed to examine the relationship between habitual sugar intake as a predictor of sleep quality among emerging adults. Sugar is present everywhere and not just in sweet candies that you buy. Everything that you consume is converted into sugar, which is later used for digestion, providing energy to the body. The body, for normal and regular functioning doesn't require any extra amount of sugar. The current study is done for the age group of 16 to 40 years of age. Standardised psychological measures were used to assess sugar intake and sleep quality. The findings revealed a very weak positive correlation between sugar intake and sleep quality. Therefore, the study did not find sufficient evidence to establish a statistically significant linear relationship between sugar intake and sleep quality among the participants. The findings suggest that sugar intake was not meaningfully associated with sleep quality within the present sample. Although the correlation was positive, its magnitude was extremely small, indicating that the two variables showed almost no linear association in the observed data.

Keywords: *Sugar, Sleep Quality, Adults*

1. Introduction

According to the World Health Organization (WHO), free sugars are "all monosaccharides (e.g., glucose and fructose) and disaccharides (e.g., sucrose) added to foods and beverages by the manufacturer, cook, or consumer, as well as sugars naturally present in honey, syrups, fruit juices, and fruit juice concentrates (1).

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In clinical and epidemiological research, "sugar" is categorized into added sugars and free sugars rather than total carbohydrate. According to WHO, 2015 "All monosaccharides and disaccharides added to foods and beverages by the manufacturer, cook, or consumer, plus sugars naturally present in honey, syrups, fruit juices, and fruit juice concentrates." are known as free sugar. Monosaccharides are single sugar units, while disaccharides are double sugars made of two monosaccharides linked together through a condensation reaction whereas, added sugars are, "Sugars that are added during the processing of foods (such as sucrose or high-fructose corn syrup) or packaged as such (e.g., table sugar, honey, molasses), excluding naturally occurring sugars found in milk and intact fruits."(U.S. Department of Agriculture [USDA] & U.S. Department of Health and Human Services [HHS], 2020).

The basic distinction revolves around that all added sugar is free sugar, but not all free sugar is added sugar. The biggest example is, the sugar in 100% fruit juice or honey is considered free sugar, even though no extra sugar was added. Among the various forms of dietary sugars, sucrose and fructose are the ones that are most consumed. Fructose is a monosaccharide naturally present in fruits and honey, whereas sucrose is a disaccharide composed of one glucose molecule and one fructose molecule. Both sugars contribute substantially to total sugar intake and are widely present in natural foods as well as processed food products (2).

To date, total urinary excretion of sucrose and fructose has been established as a predictive biomarker of sugar intake showing more coherent association with obesity than using self-reported sugar intake in several studies (3,4). Although predictive biomarkers, unlike recovery biomarkers, can be influenced by individual characteristics, they still show a strong time-related and dose-response relationship with intakes and may be useful in assessing reporting errors (5). As much as we talk about how sugar affects our body in so many ways, our entire diet takes a toll on how we function physically, emotionally, majorly about how your circadian rhythm is influenced by what you eat throughout the day. Dietary habits influence sleep quality, providing a foundation for investigating the specific role of habitual sugar intake in sleep (6). Higher sugar-sweetened beverage intake was associated with poorer sleep health over time including, poor emotional outcome. This study provides longitudinal evidence for the above as stated (7). It provides longitudinal evidence that higher consumption of sugar-sweetened beverages is associated with poorer sleep health, supporting the idea that dietary sugar intake may influence sleep (7). Excessive consumption of sugar-sweetened beverages (SSBs) is a major source of added

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sugars among adolescents and has been associated with adverse cardiometabolic, emotional, and sleep-related outcomes. Adolescents in the highest SSB tertile exhibited a 62% greater increase in depressive symptoms over 4 years. As much as this study provides authentic information but it focused only on adolescents, not young adults. Only included sugar sweetened beverage, and not habitual sugar intake. Although this study demonstrated that higher sugar-sweetened beverage intake predicts poorer sleep health among adolescents, it focused only on beverages rather than overall habitual sugar intake and was limited to an adolescent population. Therefore, further research is needed to examine the association between habitual dietary sugar intakes and sleep quality among older adolescents and young adults (16–40 years) (7).

Earlier studies have been done on how sugar intake in your early teens has an impact in your old age and how it further leads to dementia and memory loss. Having said that, studies on how a specific kind of sugar intake leads to disruption in your sleep cycle and affects your circadian rhythm. Many studies have catered to the age group of 13-25, which works well to know how adolescents divulge in emotional eating under stress.

The present study has been designed to witness how Habitual Sugar Intake has a correlation with your sleep quality for the age group of 16-40. This way it covers how adolescents, early and late adults have a correlation between sugar intake and sleep. To understand this, we can gain insight of how three age groups can have a similar effect in their sleep cycle and how sugar intake is a major contributor to waking up in midnight without any specific cause and unable to sleep on time.

2. Review of Literature

Association between short sleep duration and intake of sugar and sugar sweetened beverages

Research assessed the relation between short sleep duration and sugar and SSB intake. The body of evidence was assessed using the GRADE approach. Random and fixed effects models were used to estimate pooled OR and 95% confidence intervals. The evidence reviewed supports a significant association between shorter sleep duration and higher SSBs intake in both children and adults, while such association with higher total sugar intake was significant in children but not in adults. This study provides us with evidence of how SSB’s are a great contributor in affecting sleep for the age group for both children and adults (8).

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Relationship between added sugar intake and sleep quality among university students

This cross-sectional study with sample size was 138, and they were randomly selected, female participants in the age group of 19 to 25. Based on the collected data from 24-hour dietary recall, 13%, 59%, 5%, and 23% of the participants were from groups A, B, C, and D, respectively. We observed an inverse significant relation between added sugar intake and sleep quality based on 24-hour dietary recall data ($p = .017$). This is explained by the fact that the group with the high sugar consumption (group A) showed a higher percentage of participants with poor quality sleep compared with the low-sugar-intake group (group D); that is, with high sugar intake, 100% of the participants had poor quality sleep, whereas with low sugar intake, only 65.2% of the participants had poor quality sleep. The association between added sugar intake and sleep quality based on FFQ based on the data from the FFQ, there was a tendency toward an inverse association between the intake of added sugar and sleep quality that did not reach significance. Based on the collected scores from the FFQ, participants were classified into 3 groups: <100, low sugar intake, 100 to 199, moderate sugar intake, 200 to 299, high sugar intake. Despite the insignificant association where $p=0.15$, the percentage of participants from the bad quality sleep group tended to be lower in the low sugar intake group as compared to the moderate and high sugar intake groups (9).

How does SSB's relate to sleep and mental health in adolescents?

In a study it was investigated how over the last years, adolescents have exhibited high consumption of sugar-sweetened beverages (SSBs). During this developmental stage, characterized by profound biological and psychosocial changes, individuals are more susceptible to sleep disturbances, as well as psychological, behavioral, and emotional difficulties. The present scoping review aims to offer insights into how SSBs consumption relates to sleep and mental health outcomes in adolescents. This also shows how emotional eating also plays a major role in the amount of sugar we consume (10).

3. Methodology

3.1 *Aim*

The present study aims to examine the correlation between sugar consumed in the age group of 16 to 40 and sleep.

3.2 *Research Objective*

a) To examine how the sugar intake does in your adolescence and adulthood impacts your sleep cycle.

b) To determine whether sugar intake has a correlation with sleep or not.

c) To evaluate the total sugar intake for Indian population and its association with disturbances in sleep.

3.3 *Hypothesis*

H1: Higher sugar intake will be significantly associated with higher PSQI scores, indicating poorer sleep quality, among adolescents and adults.

3.4 *Research Design*

The present study adopted a quantitative cross-sectional, correlational research design to examine the relationship between sugar intakes and sleep quality index amount individuals aged 16-40 years. A quantitative approach was adopted as the study involved the collection and statistical analysis of numerical data obtained through self-report questionnaires. The study aimed to determine the direction and strength, however, as a correlational study, the findings cannot establish a cause-and-effect relationship between two variables. Since no variables were manipulated or controlled by the research by the researcher, the study is non-experimental in nature.

3.5 *Sample*

3.5.1 Sample Size

A total of 101 participants between the age group of 16-40 years were recruited. The participants represented diverse occupational backgrounds, including students, employed individuals, business professionals, and participants engaged in various other occupations.

3.5.2 Sampling Method

Participants were recruited using convenience sampling through an online Google Form circulated among individuals aged 16-40 years from diverse occupational backgrounds. Participation in the study was voluntary, and prior consent was obtained from all participants' prior data collection.

3.6 Variables

Independent Variable: Habitual Sugar Intake

Dependent Variable: Sleep quality

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3.7 Measures

SQ- FFQ (Semi-Quantitative Food Frequency Questionnaire): The amount of sugar consumed was passed by using the 72-item Semi Quantitative Food Frequency Questionnaire, that was developed by Kowalkowska, based on an earlier adaptation of 62- item FFQ6, that was developed by Wadolowska and Niedzwiedzka. It was used to assess the frequency of consumption of various food products and dishes, over the preceding 12 months/ The consumption frequency on a 6-point scale (1= Never or almost never), to 6= Several times a day for each item, based on standard portion sizes.

PSQI (The Pittsburgh Sleep Quality Index): is a 19-item self-report questionnaire developed in 1989 to evaluate sleep quality and disturbances over a one-month time interval. The 19 self-rated items combine into seven component scores; each scored from 0 (no difficulty) to 3 (severe difficulty).

3.8 Procedure

The data for the current study was collected via Google Form, which was shared among various college students and many business professionals through convenience sampling. Before participating, the respondents were provided with an informed consent form that explained the entire purpose of the study. Participants were informed about the confidentiality of the study and that the data being collected would be used only for academic research purposes only. Proper instructions with clear explanation were provided to fill the questionnaire. Upon the completion of data collection, the responses were screened for completeness and accuracy prior to the statistical analysis.

3.9 Statistical Analysis

The collected data were analyzed using Microsoft Excel. Descriptive statistics, including means and standard deviations, were calculated to summarize the study variables. Pearson's product-moment correlation coefficient was used to examine the relationship between sugar intakes and sleep quality among participants aged 16-40 years. The statistical significance of the correlation was assessed using a significant level of $p<0.05$.

4. Result

Table 1: *Descriptive Statistics of sugar intake and sleep quality (N=101)*

Variable	M	SD	Min.	Max.
Sugar Intake	2.168	3.272	0.025	7.309
Sleep Quality	1.257	1.188	0	5

Note: M= Mean, SD= Standard Deviation, Min.= Minimum, Max.= Maximum

Descriptive statistics were calculated for sugar intake and sleep quality among the 101 participants aged 16-40 years, as shown in the figure above, the sugar intake scores ranged from 0.025 to 7.309, with Mean= 2.168 and SD= 3.272. For sleep quality, the scores ranged from 0 to 5, with Mean= 1.257 and SD= 1,188.

Table 2. *Correlation Matrix*

Variable	SQ-FFQ	PSQI
Sugar Intake	_	
Sleep Quality	0.041	_

Pearson's product-moment correlation was conducted to examine the relationship between sugar intake and sleep quality among 101 participants aged 16-40 years. As, shown in the table above, the analysis revealed a very weak positive correlation between sugar intake and sleep quality (r= 0.041). However, this relationship was not statistically significant (p= 0.628), as p-value exceeded the conventional significance threshold of 0.05, t(99) = 0.402. Therefore, the findings did not provide sufficient evidence of a statistically significant linear relationship between sugar intake and sleep quality in the sample.

5. Discussion

The present study aimed to examine the relationship between sugar intake and sleep quality among individuals aged 16–40 years. A total of 101 participants were included in the study, and data was collected using the Semi – Quantitative Food Frequency Questionnaire (SQ-FFQ) and the Pittsburgh Sleep Quality Index (PSQI). Pearson's product-moment correlation was employed to assess the relationship between the two variables. The findings revealed a very weak positive correlation between sugar intake and PSQI scores (r = 0.041), which was not statistically significant (p = 0.628). Therefore, the study did not find sufficient evidence to establish a

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statistically significant linear relationship between sugar intake and sleep quality among the participants.

The findings suggest that sugar intake was not meaningfully associated with sleep quality within the present sample. Although the correlation was positive, its magnitude was extremely small, indicating that the two variables showed almost no linear association in the observed data. Since higher PSQI scores indicate poorer sleep quality, the positive direction of the correlation would suggest a slight tendency towards poorer sleep quality with higher sugar-intake scores. However, this tendency was negligible and statistically non-significant. Consequently, the findings do not support the hypothesis that sugar intake and sleep quality are significantly related in the studied population. Nevertheless, the absence of a statistically significant relationship does not establish that no relationship exists under different circumstances or in other populations.

Previous research has reported associations between dietary sugar consumption and sleep-related outcomes. For instance, a study examined the relationship between sleep duration, sleep quality, sugar intake, and sugar-sweetened beverage consumption among 395 university students in Iran. Their findings indicated that participants with poorer sleep quality consumed significantly greater quantities of sugar-sweetened beverages than those with better sleep quality. Furthermore, sleep quality scores were positively correlated with sugar-sweetened beverage intake. These findings differ from the results of the present study, which identified an extremely weak and statistically nonsignificant correlation between sugar intake and sleep quality. The difference may be partly explained by variations in the assessment of dietary intake, participant characteristics, and the distinction between general sugar consumption and sugar-sweetened beverage consumption (11).

Similarly, in a systematic review of 29 studies, reported that higher consumption of processed foods and foods rich in free sugars was generally associated with poorer sleep-related outcomes. However, the authors also highlighted limitations in the quality of the available evidence and noted that the predominantly observational nature of the studies restricted conclusions regarding cause-and-effect relationships. In comparison, the present study did not identify a statistically significant association between sugar intake and sleep quality. This difference highlights that relationships observed in some populations may not necessarily be replicated across all samples. It also suggests that the association between dietary habits and sleep may depend on several interacting factors rather than sugar intake alone (12).

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Several factors may help explain the findings of the present study. Sleep quality is influenced by multiple behavioral, psychological, and environmental factors, including stress, physical activity, caffeine consumption, screen exposure, sleep schedules, and overall dietary patterns. These factors may contribute to variations in sleep quality independently of sugar intake. Moreover, the relationship between diet and sleep may be complex and potentially bidirectional, as dietary habits may influence sleep while sleep patterns may also be associated with food choices. Previous research similarly emphasized the need for further research to clarify these relationships. However, since the present study did not establish the influence of these additional factors, they should be considered possible explanations rather than confirmed causes of the observed findings (12).

6. Conclusion

The present study contributes to the existing literature by examining the relationship between sugar intake and sleep quality in a sample of individuals aged 16–40 years. Its findings emphasize the importance of interpreting statistical results objectively and recognizing that an expected relationship may not always be observed in empirical research. The study also highlights the need for future investigations involving larger and more diverse samples, more detailed assessments of sugar consumption, and consideration of additional variables that may influence sleep quality. Longitudinal studies may further help clarify whether changes in sugar consumption are associated with changes in sleep patterns over time.

In conclusion, the present study found a very weak positive but statistically non-significant relationship between sugar intake and sleep quality among the participants. Therefore, the findings did not provide sufficient evidence to support a significant linear association between the two variables in the studied sample. Although previous research has reported associations between sugar-sweetened beverage consumption, free-sugar-rich foods, and poorer sleep outcomes, the findings of the present study indicate that this relationship was not demonstrated in the current sample. Further research is required to understand the possible relationship between sugar intake and sleep quality and the factors that may contribute to differences across populations.

6.1 *Limitations*

Cross-Sectional Research Design: The study used a cross-sectional design in which data were collected at a single point in time. Therefore, it was not possible to establish a cause and

effect relationship between sugar intake and sleep quality.

Sampling and Generalizability: The sample consisted of 101 participants aged 16–40 years. The sample size and composition may limit the generalizability of the findings to the wider population.

Self-Report Measures: The study relied on self-reported questionnaires, including the SQ-FFQ and PSQI. Participants' responses may have been influenced by recall bias, inaccurate estimation, or subjective perceptions of their dietary habits and sleep quality.

Limited Control of Other Variables: Factors such as caffeine consumption, stress, physical activity, screen time, and overall dietary habits were not comprehensively controlled. These factors may also influence sleep quality and could have affected the observed relationship between sugar intake and sleep quality.

6.2 *Further Implications*

Further Research with Larger Samples: Future studies may include larger and more diverse samples to improve the generalizability of findings and examine whether the relationship between sugar intake and sleep quality varies across different age groups and populations.

Use of Longitudinal and Objective Measures: Future researchers may employ longitudinal research designs and objective sleep-assessment methods to examine changes in sugar consumption and sleep quality over time and gain a deeper understanding of their possible relationship.

Exploration of Other Influencing Factors: Further studies may investigate additional variables, such as caffeine intake, stress, screen time, physical activity, and overall dietary habits, to better understand the factors that may influence sleep quality alongside sugar consumption.

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