



An analysis of the efficacy of reducing daily spices and simple carbohydrates intake on treating night sweats in toddlers

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ABSTRACT

Background: Night sweats (NS) are very prevalent in children. While numerous studies focus on NS in adults, there is a dearth of information on this condition addressing mainly children.

Methods: In this pre-post intervention study, 18 to 20-month-old subjects with severe NS but no medical conditions were assigned to a two-week sugar-and-spice-free diet. After the intervention, the prevalence, severity, frequency, and accompanying symptoms of the subjects' NS were determined in both the compliant and less compliant subjects.

Results: The population's prevalence rate of severe NS was 13.8% with no statically significant difference in age, gender, and weight. There was a positive correlation between the severity and frequency of NS. Of 29 subjects, 12 (41.4%) were completely treated, 15 (51.7%) were partially treated, and five (6.9%) experienced no change. Concerning the frequency of NS, 15 (51.7%) experienced a significant reduction, four (13.7%) a slight reduction, and 10 (34.6%) experienced no change. Also, 18 (62.1%) subjects reportedly experienced a promotion in their sleep quality.

Conclusion: Higher consumption of sugar and spices is associated with both a greater magnitude of night sweats and their frequency. Cutting down on sugar and spices, on the other hand, can result in not only a significant reduction in both the severity and frequency of night sweats but also a promotion in sleep quality.

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1. Introduction

A lot of parents referring to health centers in Yazd, Iran complain about their children's night sweats. Different factors can trigger profuse sweating, including male gender, anxiety, the time (day, night, or certain hours), medicine, physical activity, fluid intake [1], and climate. Further, sugary stuff, pepper and caffeine can stimulate the sympathetic nervous system (SNS) receptors, leading to excessive perspiration [2,3].

Night sweats, defined as excessive sweating during night's sleep, can lead to drenching sleepwear and beddings [4–6], and consequently sleep disruption [7,8]. Most of the time, the outpatient's medical history reveals no specific reason behind this condition [9].

Except for one 2012 study in Hong Kong, which discusses the prevalence and potential causes of NS in children, the majority of studies have primarily addressed night sweats in adults, menopausal women, or patients suffering from depression or anxiety. The little evidence available, however, shows that lifestyle can be associated with night

sweats [10].

Since night sweats are common in “healthy” children, and because the causes and treatments of this condition have not been identified yet, it is important that we start taking measures to manage and treat this issue. This study, approved by the Research Ethics Committee of Shahid Sadoughi University of Medical Sciences and Health Services in Yazd, Iran, (IR.SSU.MEDICINE.REC.1397.140), does not aim to address patients who suffer from nocturnal sweating due to potential causes listed in Table 1 or other medical conditions [11,12], but on “healthy” children. This study, also, aims to evaluate the effects of reducing dietary sugar and spices on the prevalence, frequency, severity, and accompanying symptoms of NS in toddlers.

2. Methods

In a pre-post study, from October 2013 to April 2014, 33 subjects were selected among 275 toddlers who were referred to Yazd health centers for vaccination. To meet the criteria, the subjects were to be

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Table 1
Potential causes of night sweats.

Malignancy	Infectious Diseases	Rheumatic Diseases	Endocrine	Drugs	Other
<ul style="list-style-type: none"> Leukemia 	<ul style="list-style-type: none"> Kissing disease Tuberculosis Lung abscess Endocarditis 	<ul style="list-style-type: none"> Takayasu arteritis Temporal arteritis Sleep apnea Reflux 	<ul style="list-style-type: none"> Hyperthyroidism Tumors Hypoglycemia Premature ovarian failure 	<ul style="list-style-type: none"> Acetaminophen Salicylate Antihypertensives phenothiazines 	<ul style="list-style-type: none"> Anxiety Iron deficiency Vitamin D deficiency

18–20 months old, healthy, and suffering from night sweats for at least a month. In other words, candidates who suffered from systematic diseases such as malignancy, heart failure, renal failure, TB, and/or systematic infections were not selected. Also, subjects who were unwilling to comply with the prescribed diet or were not cooperative during the intervention were eliminated from the study. To evaluate the families' compliance, parents were interviewed twice during the intervention period.

In order to determine the prevalence, frequency, and severity of the children's NS, parents were asked to fill out three sets of questionnaires. Questionnaire I was used to obtain information regarding the toddler's prevalence of NS during the prior month. Questionnaire II was used to collect information regarding the accompanying symptoms of night sweats, and Questionnaire III to get information regarding the participants' weekly diets. Finally, parents were asked to avoid consuming sugars and certain spices for two weeks (Table 3).

After the intervention period, the subjects' night sweats and the associated symptoms were reevaluated through Questionnaires II and III. Subjects were categorized as “partially treated” if the degree and/or

Table 2
Accompanying symptoms of NS before and after the intervention period.

Accompanying Symptoms	Before the Intervention Period	After the Intervention Period		
		Total	Partially Treated	Completely Treated
Waking up in the middle of the night and struggling to fall back asleep	7 100%	–	5 71.4%	2 28.6%
Excessive thirst during the day	20 100%	4 20%	1 5%	15 75%
Drowsiness during the day	2 100%	–	2 100%	–
Waking up thirsty in the morning	18 100%	3 16.7%	3 16.7%	12 66.7%
Waking up thirsty during the night	15 100%	2 13.3%	9 60%	4 26.7%
Having difficulty falling asleep at bedtime	13 100%	2 15.4%	4 30.8%	7 53.8%
Jolting awake	15 100%	1 6.7%	9 60%	5 33.3%
Having difficulty breathing during sleep	2 100%	–	1 50%	1 50%
Mouth breathing	4 100%	–	–	4 100%
Prone sleeping position	24 100%	1 4.2%	5 20.8%	18 75%
Restless sleep	28 100%	6 21.4%	3 10.7%	19 67.9%
Throwing off the blanket during sleep	29 100%	1 3.4%	3 10.3%	25 86.2%

Of 12 symptoms studied, drowsiness during the day, waking up in the middle of the night and struggling to fall back asleep, jolting awake, waking up thirsty in the middle of the night, and difficult breathing while asleep were 50%–100% treated.

Table 3
FQ the weekly average intake of sugary stuff and spices in the studied families.

	Food	Amount	Weekly Consumption
Child's Diet	Hamburger/bologna/sausage	1 unit	0.45 ± 0.22
	Pizza/sandwich	1 100 g slice	0.15 ± 0.05
	Ice-cream	1 or 1 small cup	2.31 ± 1.46
	Sugar cube/noghl	3 units	19.86 ± 15.73
	Rock candy	1 average piece	3.43 ± 3.41
	Sugar	1 dessert spoon	3.36 ± 2.44
	Honey	1 dessert spoon	2.27 ± 1.55
	Jam	1tbsp	2.44 ± 1.41
	Coke/beer	1 bottle (0.5 litre)	0.69 ± 0.52
	Cake/pastries	1 average piece	2.90 ± 1.84
Family's Diet	Sohan	1 bite-size piece	0.18 ± 0.03
	Gaz	1 bite-size piece	0.58 ± 0.13
	Chocolate/candy	1 piece	14.40 ± 12.44
	Sesame halvah	1 oz/28.35 g	0.40 ± 0.10
	Sesame syrup	1 tbsp	0.65 ± 0.17
	Jell-O	1 small cup	0.66 ± 0.18
	Cheese balls/potato chips	1 oz/28.35 g pack	1.60 ± 0.75
	Pepper	1 tsp	5.65 ± 4.06
	Ginger	1 tsp	2.51 ± 1.50
	Cinnamon	1 tsp	3.44 ± 2.95
Family's Diet	Saffron	1 tsp	1.20 ± 0.78
	Cumin/Caraway	1 tsp	2.23 ± 1.51
	Turmeric	1 tsp	6.24 ± 2.94

frequency of night sweats decreased to a certain extent. In other words, if a subject's parent reported “night sweats and a drenched pillow” before the intervention, but “a sweaty head only” after the intervention, the subject was categorized as “partially treated.” Similarly, a subject was categorized as “partially treated” if the number of nights he or she suffered from night sweats decreased from “every night” before the intervention to “3–4 nights” after the intervention. On the other hand, if parents reported that no night sweats occurred after complying with the diet, or if night sweats decreased from “every night” or “3–4 nights” to “maximum 2 nights,” the subjects were categorized as “completely treated.” The subject was also categorized as “completely treated” if they decreased from “three or more nights a week” to “once or twice a week,” or from “once or more times a week” to “less than once a week.”

3. Results

Of 275 children, referring to health centers in Yazd, 148 (53.8%)

were male and 127 (46.2%) were female. Overall, 105 (38.2%) suffered from night sweats: 52 (35.1%) males and 53 (41.7%) females. Thirty-eight (13.8%) suffered from severe night sweats: 21 (40.4%) males and 17 (32.1%) females. Fisher's exact test was employed to explore the variables between the two groups ($p = 0.26$). There was no statically significant difference between the females and males in regard to the prevalence and severity of night sweats.

The average age and weight of the subjects with no night sweats were 18.82 ± 1.85 months and 10.67 ± 1.17 kg, respectively. The average age and weight of participants suffering from NS were 18.61 ± 2.01 months and 10.51 ± 1.23 kg, respectively. Based on the T-test ($p = 0.320$ and $p = 0.390$), no statically significant difference was found between the prevalence of night sweats and age or weight. The average age and weight of the subjects who suffered from mild night sweats were 18.59 ± 1.72 months and 10.50 ± 1.27 kg, respectively. Subject suffering from severe night sweats had an average age and weight of 18.65 ± 2.46 months and 10.54 ± 1.17 kg. Based on the T-test ($p = 0.476$ and $p = 0.317$), no statically significant difference was found between the prevalence of night sweats and age or weight. Fifty-four (80.6%) of the subjects with mild night sweats suffered once to twice a week, while 13 (19.4%) of them suffered at least three nights a week.

Of toddlers who suffered from severe night sweats, 10 (26.3%) suffered once to twice a week, and 28 (73.7%) suffered at least three times a week. Based on the Fisher's exact test, ($p \leq 0.001$), a statically significant difference was found between the severity and the frequency of night sweats.

Four out of 33 subjects were eliminated from the study due to lack of commitment. Of the 29 remaining subjects, 13 (44.8%) were males and 16 (55.2%) were females. The average age of these subjects was 21 ± 3.71 months. Nine of these subjects suffered from mild night sweats, and 20 suffered from severe night sweats. After the intervention period, three out of the nine subjects with mild night sweats observed no change, and six were, reportedly, completely treated.

As for the 20 subjects with severe night sweats, two observed no significant change, 12 were partially treated, and six were completely treated. Overall, of 29 subjects, 12 (41.4%) were completely treated, 15 (51.7%) were partially treated, and five (6.9%) reported no change. Chi-square test ($p = 0.05$) showed a statically significant difference between the severity of night sweats before and after the intervention period.

In regard with the frequency of night sweats, of 29 subjects, 12 suffered 3–4 nights a week, and 17 suffered every single night. After the intervention, four (33.3%) of the 12 subjects were reportedly experiencing no change, and eight were reportedly experiencing less frequent NS (maximum two nights a week). Of 17 subjects, six experienced no change, four experienced NS 3–4 nights a week, and seven experienced NS maximum two nights a week. All in all, of 29 participants, 15 (51.7%) experienced a significant decrease in the frequency of their night sweats. Four (13.7%) experienced a partial decrease, and 10 (34.6%) experienced no change. Based on Chi-square test ($p = 0.043$), a statically significant difference was found between the frequency of night sweats before and after the intervention period.

Night sweats after the intervention based on the subjects' compliance with the diet

The average intake of spices and sugary stuff was 52.99 ± 23.50 units before the intervention period, and 16.90 ± 18.03 after this period. Based on the T-test ($p \leq 0.001$), a statically significant difference was found, which indicates that the population complied with the diet.

After the intervention, the population was divided into two groups:

- a) Those who had reportedly experienced no change.
- b) Those who had reportedly been partially or completely treated.

The two groups were then compared based on their compliance with the diet. The percentage of the average reduction of spices and sugar intake in the first group was 56 ± 10.68 while it was 72.57 ± 13.01 in the second group. Based on the T-test ($p = 0.011$), there was a statically difference between the degree of complying with the diet and the severity of night sweats.

At the end of the study, parents were asked about their children's sleep quality. All in all, 16 parents (62.1%) reported that their children's sleep quality had promoted while 11 parents (37.9%) reported no change. Based on Chi-Square test ($p = 0.038$), and according to parents' observations, there is a statically difference between the children's sleep quality and the frequency of night sweats; however, there is no statically significant difference between the sleep quality and the severity of night sweats ($p = 0.319$).

The accompanying symptoms

In regard to the symptoms associated with night sweats, certain symptoms were partially or completely treated in most of the subjects. These symptoms and the extent to which they were treated can be studied in [Table 2].

The FFQ Questionnaire

Through the Food Frequency Questionnaire (FFQ), the subjects and their families' average intake of certain spices and sugary stuff was estimated (Table 3).

As for the sugary stuff, sugar cubes/noghl and candy/chocolate were the most consumed with an average intake of 19.86 ± 15.73 and 12.44 ± 14.40 units a week, respectively. In regard with spices, turmeric with an average intake of 6.24 ± 2.94 and black pepper with an average intake of 5.65 ± 4.06 teaspoons a week were the most consumed.

4. Discussion

Surprisingly, little is known about night sweats in children. Most studies address night sweats in adults and hot flashes in menopausal women or special cases. Only one descriptive study was conducted in Hong-Kong which analyzes the prevalence and associated factors of NS in subjects aged six to thirteen years [13]. Our study, however, is the very first study on the effect of daily diets on night sweats in children.

In their study, "Night Sweats in Children: Prevalence and Associated Factors," Hung K So et al. studied a population of 6381 children. Based on their data, the prevalence rate of night sweats was 11.8% with a significant difference in gender; NS were more prevalent in male than in female participants [13]. In our study, however, the prevalence rate of NS in 275 toddlers aged 18–20 months was 38.2%. Of these subjects, 13.8% suffered from severe night sweats, and no statically significant difference was found between the prevalence of NS and gender. The Hong Kong's study focused on NS in subjects with sleep disorders, hyperactivity, vision problems, dermatitis, hay fever, sinusitis, asthma, and tonsillitis. Our study, however, does not focus on the mentioned symptoms except for sleep disorder. Different results of the two studies can be due to different climates, age differences, population sizes, dietary patterns, and cultural differences.

In their study, "Risk Factors for Night Sweats and Hot Flashes in Midlife: Results from a Prospective Cohort Study," Herbert Gast GC et al., focus on the relationship between dietary patterns and night sweats as well as hot flashes in menopausal women. The authors maintain that higher intake of fatty and sweet stuffs (sweet biscuits, cake, chocolate, jam) results in more night sweats and hot flashes [14]. Similarly, in our study, we observed that consuming less sugary stuff and spices reduces the frequency and severity of NS. James W. Mold and others also did a variety of studies on night sweats in adults. Their studies indicate that different variables can be associated with night

sweats. These variables include: sleep disturbances (fatigue, morning bitter taste in mouth, periodic limb movements during sleep, waking up in the middle of the night with pains in the legs) [15], hot flashes, weight gain, antihistamine use, SSRI and other antidepressants, panic attacks, alcohol consumption [16], fever, cramps, numbness in hands and legs, vision problems, hearing impairment, lightheadedness, and diabetes [17]. In another study, James W. Mold and F. Lawler indicated that people suffering from night sweats are not more mortal than others [18].

Studies on night sweats have mostly been descriptive, and they all refer to sleep disorders as one of the accompanying symptoms of night sweats. Similarly, in this study, the subjects' parents complained about their children's sleep disorders, restless sleep, jolting awake, prone sleeping position, unquenchable thirst during the night, and throwing off the blanket when sleeping. These symptoms were partially or completely treated by changing the family's daily diets. Parents also reported that their children's quality of sleep promoted as they complied with the diet. Since the sympathetic nervous system (SNS) can cause hyperactivity, insomnia, and night sweats, we can consider night sweats and their accompanying symptoms as one cluster. Different factors, including nutrition can affect this cluster. On the other hand, things that stimulate the SNS such as the capsaicin in pepper, caffeine, and simple carbohydrates can lead to proliferation of night sweats and their associated symptoms.

Even though extensive research has been carried out on night sweats, none refers to the effect of dietary sugars and spices on the incidence of night sweats. This study discovered a positive correlation between the consumption of sugars and spices and the severity and frequency of night sweats in young toddlers.

Limitations

The researchers of the study had no direct supervision on the participants during the intervention period, and data was obtained based on the parents' reports. Thus, the participants' extent of adherence to the prescribed diet and the available data were limited by subjectivity.

5. Conclusion

This study indicates that reducing the dietary simple carbohydrates and spices can be a prominent measure to partially to completely treat night sweats in toddlers. In addition, treating the toddlers' NS can significantly contribute to the reduction of sleep disturbance. Furthermore, the effectiveness of the diet is associated with the participants' adherence rate to the diet.

Compliance with ethical standards

This study was approved by the Research Ethics Committee of Shahid Sadoughi University of Medical Sciences and Health Services in Yazd, Iran.

Conflicts of interest

The authors of this study have no conflicts of interest to disclose.

Informed consent

Informed consent was obtained from all individual participants included in the study.

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Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jnim.2019.01.001>.

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