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RESEARCH ARTICLE

Honey with lemon Improves Children`s Nocturnal Cough and their Sleep Quality as well as Their Parents

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Abstract

Background: Honey has long been used as a natural remedy for coughs. Honey is rich in vitamins, minerals, antioxidants, and antibacterial compounds. It is thought to soothe the throat and serve as a cough suppressant. Vitamin C is one of the most important vitamins to help the immune system and it also acts as another powerful anti-oxidant. The aim of the study was to determine the effect of honey on nocturnal cough and sleep quality in children with cough and their parents. Materials and Method: An experimental research design was used in the present study. The study was carried out in Outpatient Clinic of Pediatric Department at Tanta University Hospital, on a sample of 100 children who fulfilled the following criteria: their age range from one year to five years, both sexes, with cough attributed to upper respiratory tract infections. One tool was used to collect the necessary information; parental assessment of their child's cough and sleep difficulty before and after honey and lemon administration. The Results of the study revealed that honey with lemon significantly reduced cough frequency, severity, and cough bothersome and improved sleep quality in children with cough, when combined with medication, compared with children received medications alone. Conclusion: Honey with lemon was more effective than medication only in reducing cough frequency, severity, and cough bothersome and improving sleep quality. Recommendations; honey with lemon is recommended to be prescribed for cough management. Further studies with larger sample size are needed to confirm the effect of honey with lemon on cough in children.

INTRODUCTION

Cough is one of the most common symptoms of children seeking medical attention. Not only does it cause discomfort for the child, but cough also elicits stress and sleepless nights for their parents [(3)]. A cough is a critical reflex action designed to promote clearing of the upper airways. Most pulmonary specialists categorize cough into acute and chronic. Acute cough lasting less than four weeks while chronic lasting longer than four weeks [(1,2)] .

Cough is more common in preschool children than in older children [(4)]. Two out of three children aged between 0 and 4 years visit their physician at least once a year with acute respiratory infections, and up to three-quarters of them will have coughs [(5)]. Most coughs are caused by acute viral infections, and 7% to 12% of coughs are due to asthma; all other causes are rare [(6)]. Evidence-based guidelines have shown that there are no effective medications to either cure or relieve the symptoms of acute cough in children. Once the pediatrician has confidently excluded the rarer and more serious conditions for which therapy is effective, explanation is required for the parent [(7, 8)].

Alternative remedies such as honey are used to treat URI symptoms including cough in many cultures. Honey has many purported health benefits and has repeatedly been shown to aid in wound healing, even for children [9, 10]. Honey is cited by the WHO as a potential treatment for cough and cold symptoms. The WHO report on the treatment of URIs in young children, honey is considered as a demulcent that is cheap, popular, and safe. Although there is no scientific evidence to support the use of honey for symptoms associated with a URI, it is suggested in the WHO report that demulcents may soothe the throat and can be recommended to provide some relief from cough in children [11]. In addition to the demulcent effect, honey has antioxidant properties and increases cytokine release, which may explain its antimicrobial effects [12].

Lemon is very high in vitamin C; in fact, the juice of one lemon contains 1/3 of the recommended daily allowance for children. Vitamin C is one of the most important vitamins to help the immune system and it also acts as another powerful anti-oxidant. Lemons also have been shown to have very strong antibacterial and antiviral properties [13].The combination of honey and lemon is a traditional cure for cough that has gained a great deal of respect in the medical community due to the individual and combined power of the ingredients [9].

The basis for recipes of Honey and Lemon for Cough is, of course, honey and lemon. The simplest recipe is a combination of 1-cup of warm, local honey and 3-tablespoons of freshly squeezed lemon juice. First add ¼ cup of warm water to the mixture and then stir until smooth. The child should take 1-2 tablespoons of the mixture at the first sign of cough and another dose before bed for a good night's sleep. Recipes should be refrigerated, and the leftover mixture remains fine for up to a month **[14]**.

The WHO and American Academy of Pediatrics recommend honey to help in calming a cough. It's not clear exactly how honey eases a cough. **Cathy W** (2012) noted that honey contains more than 181 different natural substances and suggested that its antioxidant and antimicrobial properties may explain why it helps to relieve the children's coughs. In addition to honey coating the throat and triggering the swallowing mechanism, its sweetness likely changes the sensitivity of sensory fibres [15].

The aim of the study was to determine effect of honey with lemon on nocturnal cough and sleep quality for children with cough and their parents.

Research design: An experimental research design(Randomized controlled study) was used in the present study.

Research hypotheses:- honey with lemon will improve child nocturnal cough and sleep quality for children and their parents.

Setting of the study:-

The study was carried out in Outpatient Clinic of Pediatric Department at Tanta University Hospital.

Subject:-

The study was carried out on a sample of 100 children who fulfilled the following criteria: their age ranged from one year to five years, both sexes, with cough attributed to upper respiratory tract infections (URIs). The URIs were characterized by the presence of rhinorrhea and cough for 7 or fewer days' duration [16,17].

Exclusion criteria: Children were excluded if their cough was attributed to bronchial asthma, pneumonia, laryngotracheobronchitis, sinusitis, or allergic rhinitis.

The subjects were randomly assigned into two groups, who were equally divided (the first child who met the criteria was assigned to experimental group who received cough medication and 2 teaspoons of citrus honey before sleep for two consecutive days , and the second infant was assigned to the control group who received cough medication only).

Tools for data collection:-

One tool was used to collect the necessary data.

Tool (I):- parental assessments of their child's cough and sleep difficulty

This tool consists of two parts namely:-

Part I: - it included baseline and socio-demographic data of the studied children as age, sex.

Part II:- Likert scale for parental assessments of their child's cough and sleep difficulty

- Parental assessments of their child's cough and sleep difficulty on the previous night and at night after honey and lemon administration were assessed through previously validated questions using a 7-point Likert scale.
- Parent responses ranged from extremely (6 points) to not at all (0 points), for each of nocturnal cough frequency, the bothersome nature of the cough, effect on the child's sleep, and effect on parental sleep.

Likert scale to parental assessments of their child's cough and sleep difficulty include:

1- How frequent was your child's coughing last night?
□ 6extremely □ 3 somewhat
□ 5very much □ 2 little
□ 4Alot □1not much □ 0 not at all

2- How severe your child's cough last night?
□ 6extremely □ 3 somewhat
□ 5very much □ 2 little
□ 4Alot □1not much □ 0 not at all

3- How bothersome was last night cough to your child's?
□ 6extremely □ 3 somewhat
□ 5very much □ 2 little
□ 4Alot □1not much □ 0 not at all

4- How much did last night cough affect your child's ability to sleep?
□ 6extremely □ 3 somewhat
□ 5very much □ 2 little
□ 4Alot □1not much □ 0 not at all

5- How much did last night cough affect your (parent) ability to sleep?
□ 6extremely □ 3 somewhat
□ 5very much □ 2 little
□ 4Alot □1not much □ 0 not at all

METHODS

1- Before conducting the study, a written permission letter was obtained from the Faculty of Nursing Tanta University to the manager of Pediatric Outpatient Clinics of Tanta University in order to obtain an approval to carry out the study.
2- Medical ethics: Approval of the study was taken from the Faculty of Nursing to the manager of the previous setting in order to attain an approval to carry out the study. Informed written and oral consent was obtained from the parents to participate into the study. Confidentiality was assured.
3- A pilot study was carried out before starting the data collection. It was done on ten infants to test the identify feasibility and applicability of the tools used and they were excluded from the study sample.

4- Studied children were classified into 2 groups, experimental group who received cough medication and 2 teaspoons of citrus honey for two consecutive days, and the control group who received cough medication only.
5- Baseline assessment was used individually by the researchers for each child in the two groups.
6- Each child was assigned randomly to one of the two groups, where the first infant who met the criteria assigned to the experimental group and the second infant assigned to the control group and the third infant to the experimental group and so…on.
7- Recipe of Honey and Lemon for cough used were a combination of 1-cup of warm, local honey and 3-tablespoons of freshly squeezed lemon juice, then ¼ cup of warm water was added to the mixture and then stirred until smooth. The child should take two tablespoons of the mixture at the first sign of cough and another dose 30 minutes before the child going to bed for a good night's sleep [(18)] .
8- Nocturnal cough frequency, the bothersome nature of the cough, effect on the child's sleep, and effect on parental sleep based on the previous night's symptoms and after honey and lemon night were assessed by Likert scale.
9- Total Likert scale score was summed for both groups.

Data collection:-

The data were collected over a period of 4 months starting from November 2014 to February 2015

Statistical analysis:

The collected data were organized, tabulated and statistically analyzed using SPSS version 19 (Statistical Package for Social Studies). For each variable the number and percentage distribution were calculated. The mean and standard deviation were calculated for the Likert scale before and one day after honey and lemon administration. The level of significance was adopted at $p<0.05\%$.

Results

Table (I) shows the socio-demographic characteristics of the studied children. It was found that, the age of 38% of the experimental group and 34% of the control group children was between one to two years, 30% and 28% of the experimental and control group were between two to three years respectively, 22% and 26% of the experimental and control group were between three to four years respectively, and 10%, 12% of the experimental and control group were between four to five years respectively. No statistically significant difference was found between two groups as regards age. In relation to children sex, it was observed that 70% and 60% of the experimental and control children were males respectively while, 30% and40% of the experimental and control group were females respectively.

Table (2) presents baseline characteristics of children cough. The table revealed that the mean of duration of illness was 5±1.89 and 4±1.53 for the experimental and control group respectively. The table also revealed that the mean of Cough frequency was 5.49 ±2.12 and 4.98±1.21 for the experimental and control group respectively. Furthermore, the mean of Cough severity was 4.02±1.35 and 3.93±0.94 for the experimental and control group respectively, the mean of bothersome of Cough was 4.05±1.23 and 3.87±1.2 for the experimental and control group respectively, and the mean of effect of cough on child sleep was 4.34±1.32 and 4.5±1.45 for the experimental and control group respectively. In addition, the mean of effect of cough on parent sleep was 4.73±1.29 and 4.65±1.36 for the experimental and control group respectively. The mean of the total score of the likert scale was 19.99±4.439and 20.23±4.95 for the experimental and control group respectively. No statistically significant difference was found between two groups in baseline characteristics of children cough.

Figure (1) shows the effect of honey with Lemon on cough frequency. There were statistically significant differences between the first and second day in cough frequency for the experimental group as the mean Likert scale of cough frequency decreased to 2.11 in the second day compared to 5.49 in the first day and also between the experimental and control group whereas the mean of the Likert scale of cough frequency for the experimental in the second day is 2.11 compared to 4.05 for the control group ($p<0.05$).

Figure (2) illustrates the effect of honey with Lemon on cough severity. There were statistically significant differences between the first and second day in cough severity for the experimental group as the mean Likert scale decreased to 1.45 in the second day compared to 4.02 in the first day and also between the experimental and control group whereas the mean of the Likert scale of cough severity for the experimental group in the second day is 1.45 compared to 3.21 for the control group ($p<0.05$).

Figure (3) illustrates effect of honey with Lemon on cough bothersome. There were statistically significant differences between the first and second day in cough bothersome for the experimental group as the mean Likert scale decreased to 1.36 in the second day compared to 4.05 in the first day and also between the experimental and

control group whereas the mean of the Likert scale for the experimental group in the second day is 1.36 compared to 2.74 for the control group ($p<0.05$).

Figure (4) illustrates effect of cough with Lemon on child sleep before and after honey administration. There were statistically significant differences between the first and second day in child sleep for the experimental group as the mean Likert scale decreased to 1.04 in the second day compared to 4.34 in the first day and also between the experimental and control group whereas the mean of the Likert scale for the experimental group in the second day is 1.04 compared to 3.65 for the control group ($p<0.05$).

Figure (5) illustrates effect of cough on parent sleep before and after honey with Lemon administration. There were statistically significant differences between the first and second day in parent sleep for the experimental group as the mean Likert scale decreased to 1.4 in the second day compared to 4.73 in the first day and also between the experimental and control group whereas the mean of the Likert scale for the experimental group in the second day is 1.4 compared to 3.87 for the control group ($p<0.05$).

Figure (6) demonstrate Total Likert scale score. There were statistically significant differences between the first and second day in the total Likert scale score for the experimental group and also between the experimental and control group as the mean of the total Likert scale was 20.23 for the experimental group in the first day compared to 9.87 in the second day after administration of honey while the mean of the total Likert scale was 19.99 for the control group in the first day compared to 15.97 in the second day ($p<0.05$).

Table (1): Socio-demographic Characteristics of the studied Children

Socio-demographic Characteristics	experimental group		Control group	
	No	%	No	%
Age /years-				
1-2	19	38.0	17	34.0
2-3	15	30.0	14	28.0
3-4	11	22.0	13	26.0
4-5	5	10.0	6	12.0
Total	50	100.0	50	100.0
Mean ±SD	3.75±1.92		3.22±1.72	
	p-value = 0.999			
- Sex				
Male	35	70.0	30	60.0
Female	15	30.0	20	40.0

Table (2): Baseline Characteristics of Children cough

Baseline Characteristics	experimental group Mean ±SD	Control group Mean ±SD	p-value
Duration of illness	4±1.53	5±1.89	0.999
Cough frequency	5.49 ±2.12	4.98±1.21	0.999
Cough severity	4.02±1.35	3.93±0.94	0.998
Bothersome of Cough	3.87±1.2	4.05±1.23	0.988
Effect of Cough on child sleep	4.5±1.45	4.34±1.32	0.999
Effect of Cough on parent sleep	4.65±1.36	4.73±1.29	0.999
Total Likert scale score	20.23±4.95	19.99±4.43	0.999

Figure (1): Effect of Honey with Lemon on cough frequency

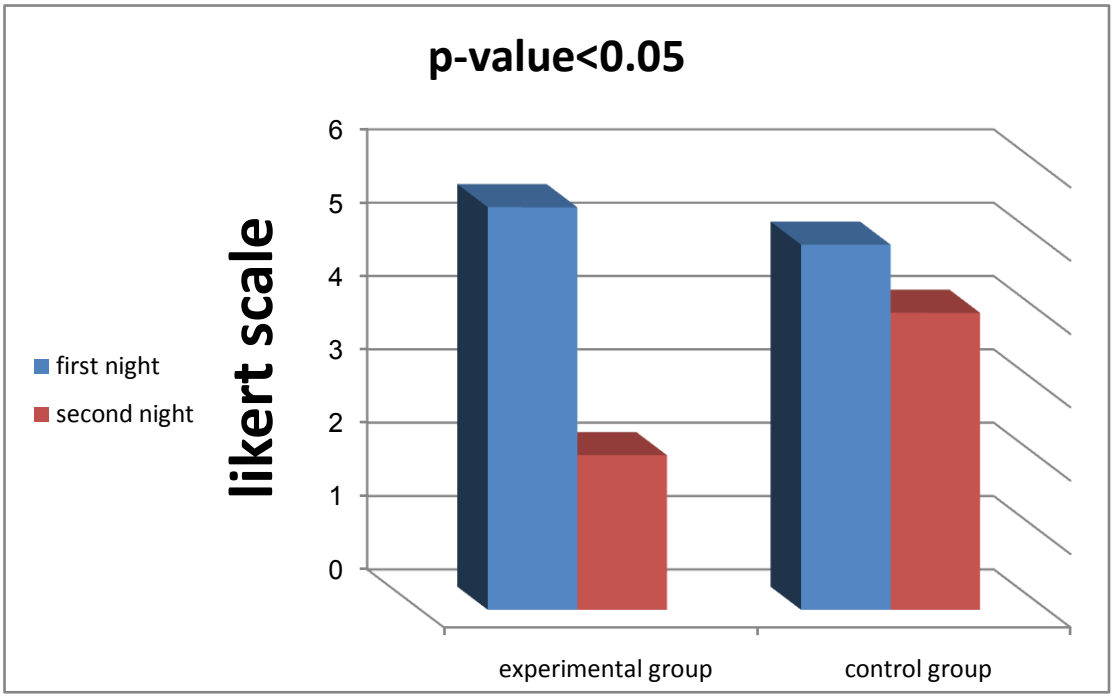


Figure (2): Effect of honey with Lemon on cough severity

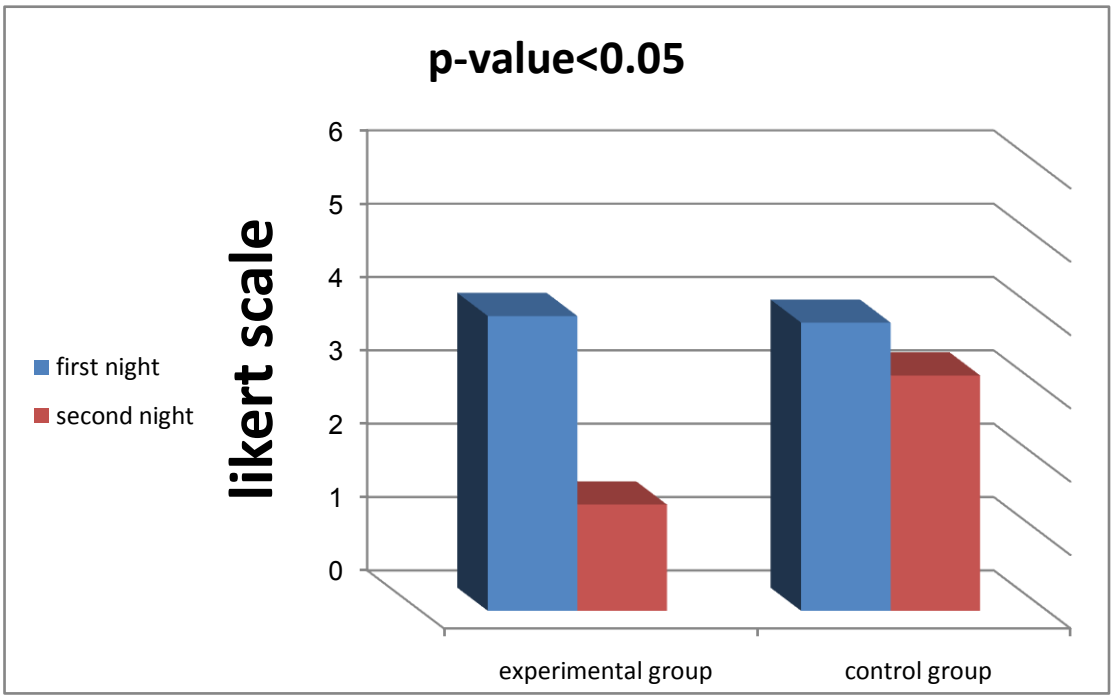


Figure (3): Effect of honey with Lemon on cough bothersome

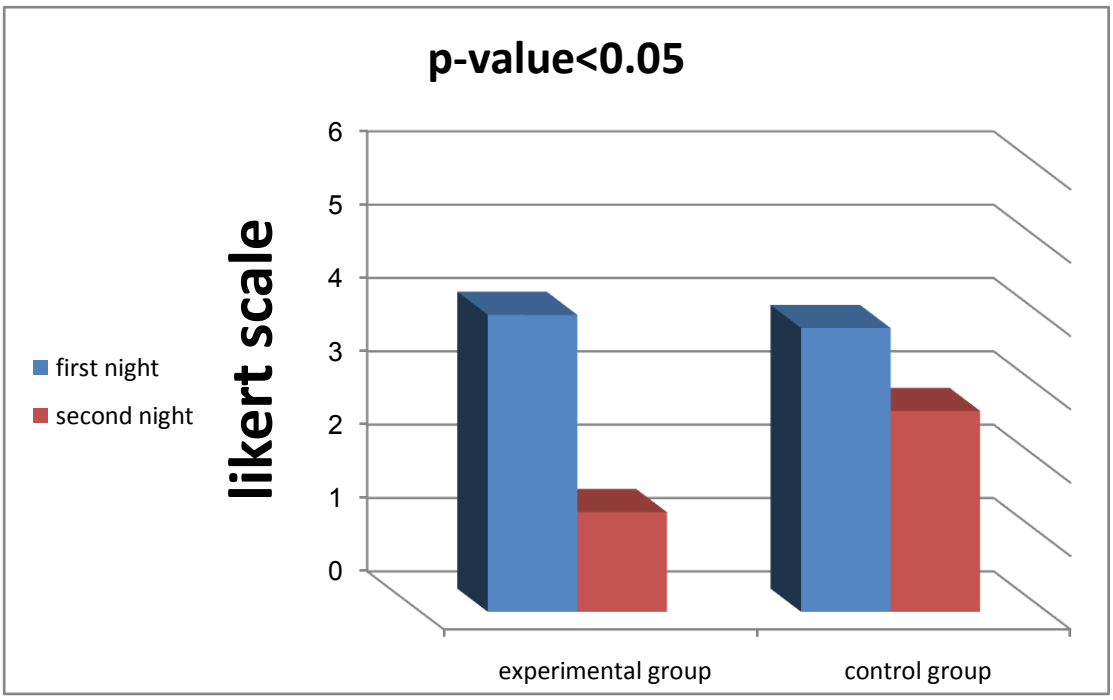


Figure (4): Effect of honey with Lemon on child sleep

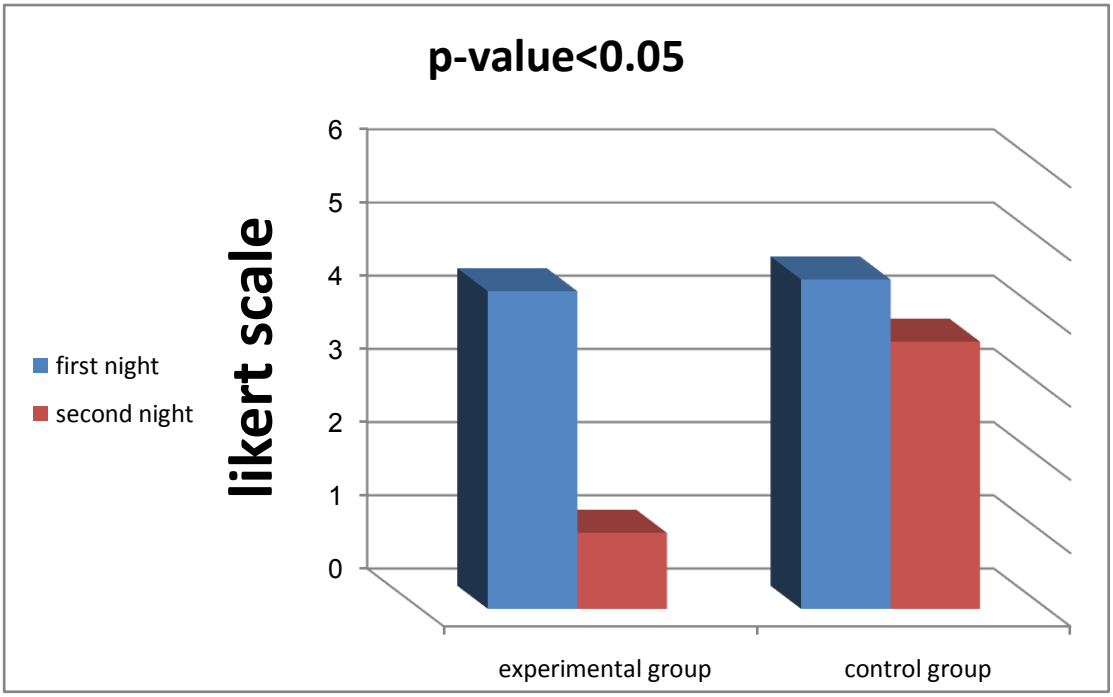


Figure (5): Effect of honey with Lemon on parent sleep.

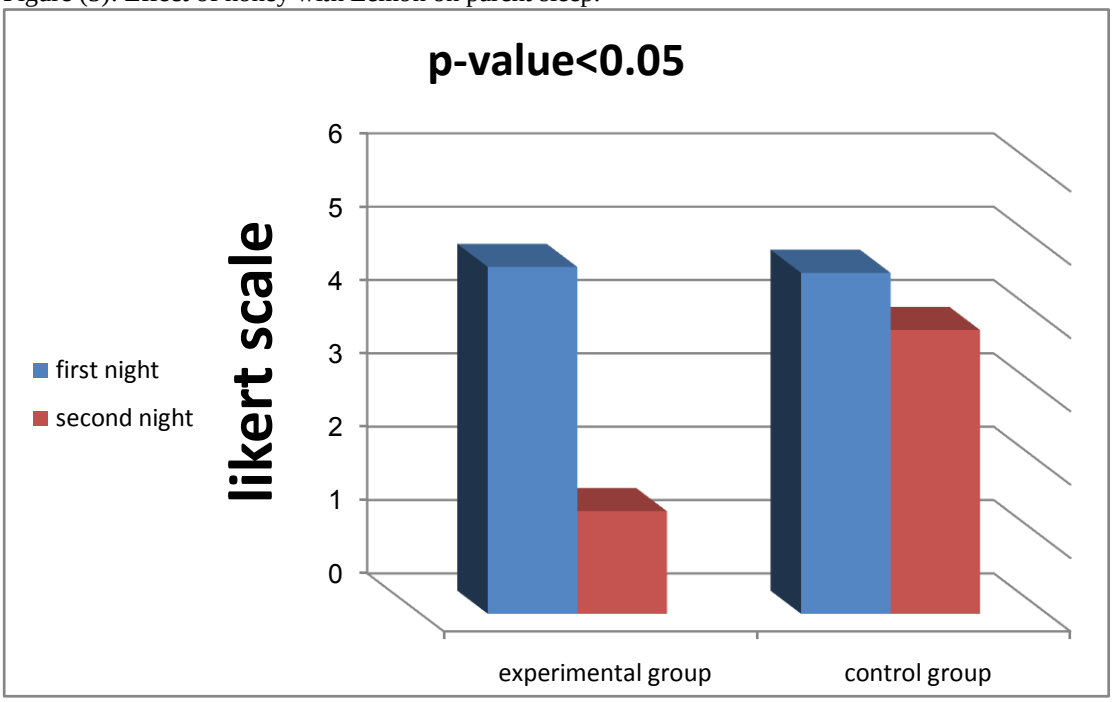
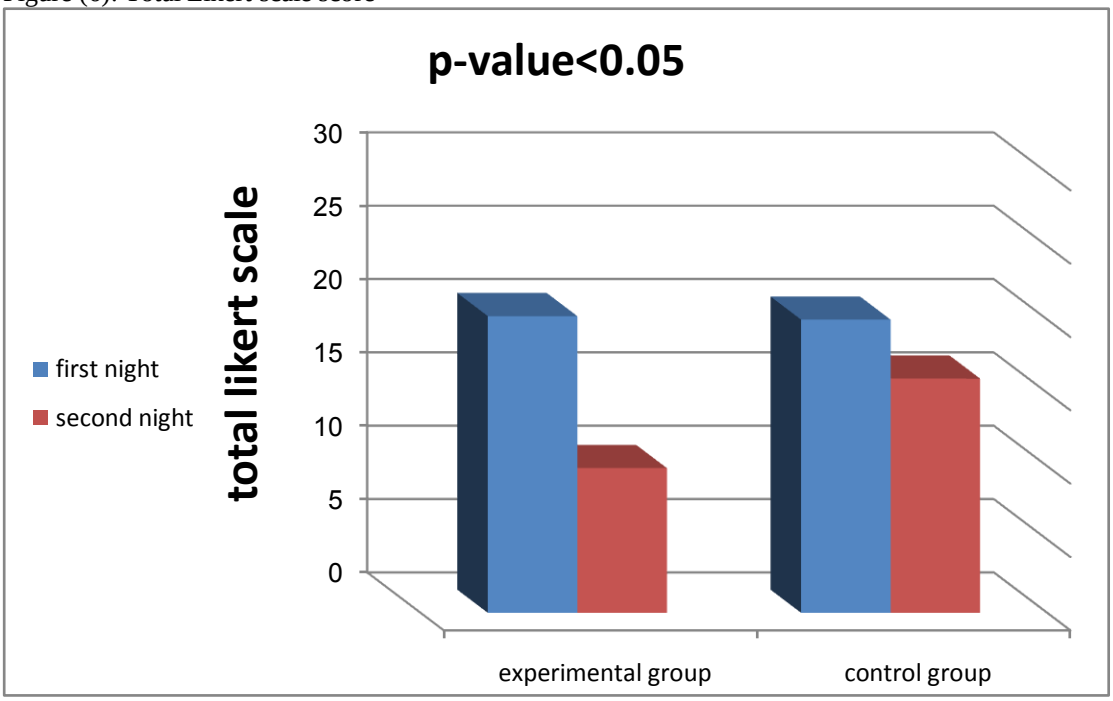


Figure (6): Total Likert scale score



Discussion

The desire to ease the symptoms associated with URIs, particularly cough and its associated sleep difficulty is great. Both physicians and parents want symptomatic relief for children suffering from cough [19]. Honey has long been used as a natural remedy for coughs, a common symptom of colds, bronchitis, and the flu. The use of cough

and cold medications is discouraged by professional societies and the Food and Drug Administration. Home remedies, such as honey and lemon are inexpensive and could be safe alternatives for the treatment of cough. [20,21]. The results of current study revealed that honey with lemon mix was more effective in reducing cough frequency, severity, and cough bothersome and improving sleep quality of cough. These results could be explained in the light of the effect of honey as antioxidant and antimicrobial effects, which have been suggested as the mechanism for its efficacy in wound healing and may help to explain its superiority in this study. Honey tends to have a higher content of phenolic compounds [19, 22]. These phenolic compounds have been associated with the antioxidant properties of honey that may have contributed to its effect in this study. Further, its topical demulcent effect may contribute to its benefits for cough as postulated by the WHO [23, 24]. The lemon has healing properties. The honey soothes the raw tissues of the throat while the lemon juice builds the immunity and controls infection. The combination of lemon and honey works wonders in relieving a cough. This combination of lemon and honey soothes an irritated throat and suppresses the racking cough making the child and parents relax and get a good night's rest [25]. Furthermore, **Eccles** reported that the sweetness of the honey used to treat cough accounts for a significant portion of the treatment effect. This hypothesis is based on the suggestion that sweet substances naturally cause reflex salivation and may also cause the secretion of airway mucus and lead to a demulcent effect on the pharynx and larynx, thereby reducing cough particularly dry, unproductive cough. Additionally, the endogenous opioids are produced following consumption of sweet substances. Because of the close anatomical relationship between the sensory nerve fibers that initiate cough and the gustatory nerve fibers that taste sweetness, **Eccles** suggested that an interaction between the opioid-responsive sensory fibers and the gustatory nerves may help to produce the antitussive effects of sweet substances via a central nervous system mechanism [26].

The results of the present study are in agreement with **Paul IM** et.al., who found that honey is the most effective treatment for all of the outcomes related to cough, child sleep, and parent sleep [27] . The results of the present study are also in accordance with **Rozen J et.,al**, who reported that a small dose of honey given before bedtime provided better relief of nighttime cough and sleep difficulty in children than no treatment or dextromethorphan (DM), a cough suppressant found in many over-the-counter cold medications [28]. Moreover**, the Cochrane Database** of Systematic Reviews, scientists sized up all available clinical trials comparing honey alone or in combination with antibiotics , with no treatment, placebo, or over-the-counter medications for relief of cough in children. Study results showed that honey was more effective in reducing cough frequency and improving sleep quality compared to no treatment [22].

Conclusion

Based on the findings of the present study, it is concluded that honey with lemon mixture is better than using medications alone for reducing cough frequency severity, and cough bothersome and improving sleep quality of cough.

Recommendations

Based on the previous findings and conclusion drawn from the current study, honey with lemon is recommended to be prescribed for cough management, and further studies are needed to confirm the effect of honey with lemon on children cough.

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