Effect of Gargling with Warm Salty Green Tea on Signs and Symptoms of Acute Upper Respiratory Tract Infection among Children

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Abstract

Background

Green tea and salt had been known for a long time as an effective home remedy for common cold and flu. We aimed to evaluate the effect of gargling with warm salty green tea on signs and symptoms of acute upper respiratory tract infection (AURTI) among children.

Materials and Methods

A two group, quasi-experimental research design was adopted. Tools: (1) structured interview to collect socio-demographic data of children, and history of the child's disease (2) signs and symptoms of AURTI inventory. Samples: A purposive sample of 200 school age children who attended the outpatient clinics in Cairo University Specialized Pediatric Hospital (CUSPH), Cairo, Egypt. 200 cases were assigned randomly as follows: 100 children as controls for whom analgesics were prescribed, and 100 children as intervention group, who were given salty green tea gargling in addition to analgesics; data of signs and symptom severity were collected on daily basis for three consecutive days.

Results

There was a highly significant difference between controls and intervention group regarding total mean score of signs and symptoms (p-value<0.01). In addition, there was a highly significant positive correlation between children's age, sex, residence, presence of a smoking family member and presence of another family member with similar condition and the total mean signs and symptoms score in control and intervention groups.

Conclusion

Children with AURTI in intervention group showed less total mean signs and symptoms scores than those in the control group. Recommendations: Experimental studies on larger random samples need to be conducted to explore the effect of gargling with salty warm green tea on the signs and symptoms of AURTI.

Key Words: Acute upper respiratory tract infection, Children, Gargling, Nursing, Salty green tea.

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1- INTRODUCTION

World Health Organization (WHO) estimated that acute respiratory infections (ARI) cause annual deaths approaching four million, at a rate of more than 60 deaths/100,000 populations (1). Viruses are responsible for 30–70% of ARI. The weather of Egypt is characterized by being hot on summer days, warm or mild on winter days, but warm on summer nights, and cold on winter nights. Because of these climate changes, viral infections could have annual and seasonal patterns, especially in children (2). Viral infections were encountered in about one-third of hospitalized Egyptian adult and pediatric patients with severe acute respiratory tract infections, while atypical bacteria had a minor role (3). ARI is considered one of the major health problems and it is a leading cause of morbidity and mortality in children (4). It occurs at the rate of 6-8 episodes for children under five years of age and leads to pneumonia, which is responsible for 15% of deaths in that age group in Egypt (5). Common cold is a viral upper respiratory tract infection (URTI); it is a symptom complex usually caused by several families of virus; these are the rhinovirus, coronavirus, parainfluenza, respiratory syncytial virus (RSV), adenovirus, human metapneumovirus and influenza. Occasionally the enterovirus is implicated in summer. Recently, the newly discovered bocavirus (related to the parvovirus) has also been linked to URTI. Hence, specific antiviral treatment is impractical (5, 6). Manifestations of common cold are coughing, sneezing, congestion, and runny nose, throat pain during swallowing, headache, vomiting and diarrhea caused by swallowing of the coughed sputum. Treatment of URTI usually includes inappropriately prescribed antibiotics even if the cause is viral; resistance to antibiotics is a complex and growing international public health problem (7, 8). Worldwide strategies to control antimicrobial resistance and its major consequences (increased mortality, economic impact) are being developed (9, 10). Now, formal policies advising on the need for alternative strategies to antibiotics do not include the study and/or application of complementary and alternative therapies for symptom relief and/or treatment of infections to reduce the use of antibiotics (11). Gargling is a technique in which a solution is used that is believed to treat the symptoms of URTI such as sore throat, pain during swallowing, and cough.

Frequent gargling with water, saline and green tea may help in reducing episodes of URTI, but evidence is limited to a single study (12). Inhibition of viral replication in the presence of chloride/halide salts was recently supported by laboratory evidence that reported non-myeloid cells (e.g. epithelial, fibroblast and hepatic cells) have an innate immune mechanism, which is augmented in the presence of salt (NaCl) (13). In cell culture models, DNA, RNA, enveloped and non-enveloped viruses are all inhibited in the presence of NaCl. The antiviral effect is dependent on the availability of chloride ions (and not sodium ions). In the presence of viral infection and the availability of NaCl, cells utilize the chloride ions to produce hypochlorous acid (HOCl) (8).

Since HOCl is the active ingredient in bleach, which is known to have an antiviral effect, the mechanism could be augmented by supplying chloride ions through NaCl to treat infections (14, 15). Green tea has anti-inflammatory and anti-oxidant effects. It contains caffeine, catechins, polyphenols, vitamins B, C, and E, flavonoids, glycoprotein, and carotenoids fibroids. Glycoproteins have various biological activities, such as anti-inflammatory properties. Green tea can be used to reduce these symptoms (16). Researchers believe that green tea is a natural substance, anti-inflammatory, and harmless and can reduce cough and

hoarseness. Green tea catechins are reported to have various physiological activities, including antioxidative, anticancer, hypolipidemic, hypoglycemic, hypotensive, antibacterial, and antiviral effects. Moreover, in vitro studies have revealed that green tea catechins inhibit viral infectivity and proliferation by blocking adsorption, hemagglutination, virus assembly, or maturation cleavage (17). Nurses are the front line caregivers in the field of pediatrics. Vital signs and pain assessment are basic tools to help in the diagnosis as well as to measure the condition's progression. Cough care and measures that help in alleviation of the symptoms are the kind of teaching that pediatric doctors and nurses provide mothers of children with URTI. These measures include increase of warm fluid intake especially herbal warm drinks as anise, soft and semisolid diet, avoidance of spicy food, increase in vitamins in the diet through vegetables and fruits rich in vitamin C, medication effects and side effects (18).

However, pediatric doctors and nurses need to explore the effect of other complementary medicine remedies in the field of care and prevention and treatment of viral upper respiratory tract infections. Health providers are well placed to reassure and support families, and to provide education regarding the facts about fever, the appropriate use of a single antipyretic medication, how to avoid dehydration in children with URTIs (19). Although studies in Europe have shown that complementary alternative medicine practices may have lowered antibiotic prescription rates compared to conventional practices, due to additional strategies regarding prevention and treatment of viral infections (7-10). Nevertheless, there is growing evidence in the western researches regarding the use of gargling with salty solution or green tee to prevent viral upper respiratory infection

(11, 12). In a systematic review conducted by Furushima et al., (2018) on the effect of green tea catechins on influenza infection and including five clinical trial randomized studies that used gargling with green tea to prevent URTI, the researcher recommended the need for more researches to be done on its effect on prevention and treatment of URTI (20). The world is experiencing a critical time of viral COVID-19 pandemic nowadays, with the absence of vaccines and effective treatment and with the growing evidence of the effect of green tea in prevention of viral pharyngitis, common cold and flu; it is the time to explore its effect on the treatment of AURTI. The need is still very high to evaluate the effect of gargling on reduction of symptoms of upper respiratory tract infections among Egyptian children; that is why the current study is thought to be of significance to fill this knowledge gap. As well as providing guidance and recommendations, that should be reflected in pediatric nursing education and practice. Therefore, we aimed to evaluate the effect of gargling with salty green tea on acute upper respiratory tract infection (AURTI) signs and symptoms among children.

2- MATERIALS AND METHODS

2-1. Study design and population

Research hypothesis

Children with AURTI who gargle with warm salty green tea will show lower scores of signs and symptoms than those who do not.

Research design

A two-group quasi-experimental design was utilized in the current study. It is one type of effective research design that is very helpful to the true experimental design except for either complete laboratory control on the extraneous variables that might affect the results or

randomization which affects the generalizability of the results (21).

Setting

The study was conducted in the pediatric outpatient clinics, at CUSPH, Cairo, Egypt.

Sample

A purposive sample of 200 children who attended general pediatric clinics participated in the current study. The sample was collected within five months (October 2019 – February 2020). Serial numbers from 1-200 were given to children, children who received odd numbers were assigned to the control group (100 children), and children who received even numbers were intervention group (100 children).

The pediatrician performed detailed history taking and thorough clinical examination in order to differentiate common colds and viral URTI from other conditions that require targeted therapy such as streptococcal pharyngitis, bacterial sinusitis, and lower RTI because clinical manifestations of these conditions may significantly overlap. Clinical manifestations of common cold and viral URIs include scratchy or sore throat, nasal discharge and congestion or cough; nasal discharge usually begins as clear and changes throughout the course of the illness. Fever, if present, occurs early.

2-2. Operational Definitions

For the purpose of the current study, the following definition of terms is used:

▪ Salty green tea solution: 150 ml of warm green tea solution to which a small spoon filled with table salt is added.

▪ Gargling: a technique of mouth and throat wash with liquid kept in the mouth, and while the mouth is open, the child breathes through it with a gargling sound (22). This gargling will last 30 seconds and is repeated until the amount of solution finishes.

2-3. Inclusion criteria

The inclusion criteria including children age 7- 12 years and children diagnosed as viral URTI.

2-4. Exclusion criteria

The exclusion criteria including children below 7 years (not able to gargle properly), children with any disabilities (such as Down Syndrome, etc.), children with immunosuppressive disorders, and children with bacterial or fungal infection.

2-5. Ethical Considerations

The written consent was obtained from the mothers after clear explanation of the purpose and nature of the study in order to obtain their acceptance as well as their cooperation. The researchers assured mothers that all data gathered during the study are confidential and that they can withdraw from study without any effect on the care provided to their children. For ethical considerations, data were collected firstly from children in the control group.

2-6. Data collection tools

The required data was collected through the following two tools:

2-6-1. Structured interview questionnaire

It was developed by the researchers, it includes 15 questions and is composed of two parts:

Part I: To assess personal characteristics of children and their mothers, it involved nine questions about the children such as (age, gender, rank and diagnosis, etc.).

Part II: It contains 6 questions about disease history (disease duration, pain during swallowing, fever, discomfort, etc.).

2-6-2. Signs and symptoms inventory

It contained (10) items that are common signs and symptoms of the URTI as (fever, cough, sneezing, etc.). The signs and symptoms scale developed by the researchers composed of 10 items. Each item was scored as follows: not present (0), mild (1), moderate (2), and sever (3). Scores 0-10 are considered mild, 11-20 are moderate and 21-30 are severe. For statistical purposes, body temperature of children was measured axillary and was ranked as: no fever ≤ 37.5, mild is 37.6 ≤ 38, moderate is 38.1≤ 38.5 and high or sever is ≥38.6 ℃. Body temperature ranges were based on relevant pediatric reference by Stuttgart (2019) (23).

2-7. Validity and Reliability

Data collection tools were submitted to five experts (three from pediatric nursing field and two pediatricians) to test the content validity. The tool was examined for content coverage, clarity, relevance, applicability, wording, length, format, and overall appearance. The experts agreed on the content of the structured questionnaire sheet but recommended minor language changes that would make the information clearer and more precise and the suggested changes were made. The reliability of tools was performed to confirm its consistency using Cronbach's alpha and the results reliability was 0.86. Pilot study was carried out on 10% (20 individuals) of the total sample of children and their mothers to assess the feasibility, objectivity, applicability, clarity, adequacy, and content validity of the study tools and time required to fulfill it and to determine possible problems in the methodological approach or instrument. The results of the pilot study were used to test the proposed statistical and data analysis methods. The tools were completed without difficulty, adding support to the validity of the instrument. The pilot study subjects (children and their mothers) were included to the total sample of the study.

2-8. Data Collection Procedures

As the green tea is a safe home remedy that was used long time ago without any reported side effect, an official permission was secured before the data collection from director of CUSPH and the chairperson of pediatric outpatient clinics after full description of the aim of study aim. After the child was assessed by the pediatrician, and diagnosed as viral AURTI, the researchers introduced themself to the mothers and their children. The researcher discussed clear explanations about of the aim and nature of the study for each child and their mothers who fulfilled inclusion criteria. An oral approval was obtained from each child and their mothers to get their acceptance and cooperation. Acceptance was obtained from mothers of children in the study according to inclusion criteria. Then researchers interviewed mothers and children in both control and intervention group to fill the structured interview questionnaire on individual bases. For the control group the researchers only exchanged the cell phone numbers to follow them up for three days (the signs and symptoms of AURTI), and make sure that they take their routine care. In CUSPH out-patient clinics, the routine care for children with sore throat and viral AURTI includes advising safe remedies (i.e. sipping of warm beverages such as honey or lemon tea, chicken soup), and analgesics based on physician prescription (e.g. paracetamol). For children in the intervention group, the researchers taught the mother how to prepare the salty green tea gargling solution (prepared form boiling green tea leaves for at least five minutes), and instructed children on duration of each gargling bout (30 seconds per each). The mothers were instructed to provide the gargling once/6 hours (one hour after meals). To ensure that mothers will follow the instructions the researchers provided each mother with an amount of green tea that is enough for the intervention period and instructions. Also,

researchers' exchanged cellphone numbers with the mothers and the researchers answered the questions of the mothers regarding the child's condition and collected the data regarding symptom severity on a daily basis for each child for three days. The time needed for each mother and child to complete the questionnaire and for the instructions of the gargling and how to prepare the gargling solution ranged from 30-45 minutes. Sample collection was conducted over five months extending from October 2019 until February 2020. Mothers were interviewed in the nurse station area to ensure they were able to concentrate and reply to questions fairly.

2-9. Statistical analysis

The collected data was tabulated and summarized. The Statistical Package for Social Studies (SPSS) version 20.0 was used for statistical analysis of data. Data was computerized and analyzed using appropriate descriptive and inferential statistical tests. Qualitative data were expressed as frequency and percentage. Means and standard deviation was performed for every variable and comparison between means was done using t-test. Correlation among variables was done using Pearson correlation coefficient. The levels of significance at

p<0.05 and p<0.001 were used as cut off values for statistical significance.

3- RESULTS

Table.1 shows that half (50% and 49%) of the mothers' age range in both control and intervention groups was between 20-30 years with means age of 28.4 ± 2.8 years, and 27.8 ± 2.1 years, respectively. While almost two thirds of them (65 and 62%) were high school certified; 75 and 81% of them were housewives in both control and intervention groups, respectively. Regarding child's sex (70 and 74%) were males in control and intervention group, respectively. Children's mean age in the control group was 8.5 ± 1.4 years and in the intervention groups was 8.4 ± 1.7 years (P>0.05). Rural areas were the place of residence for 75% and 71% of children in control and intervention groups, respectively. Majority of children in control and intervention group had a smoking family member (85% and 79%, respectively); while most of them in both groups had no other family member with the similar condition (85% and 89%, respectively). There were no significance differences regarding socio-demographic data of children and their mothers between both groups (P>0.05).

Table-1: Baseline characteristics of the children and their mothers in control and intervention groups (n=200).

Variables	Control group (n=100)		Intervention group (n=100)		Test	P-value
	No	%	N0	%		
Mother's age:						
- 20-<30 years	50	50	49	49		
- 30-35 years	35	35	37	37		
- Above 35 years	15	15	14	14	t. =0.899	0.323
Mean ± SD	28.4 ± 2.8years		27.8 ± 2.1 years			
Mother's education:						
- Primary certified	15	15	20	20	χ2 =0.455	0.513
- Prep level certified	20	20	18	18		
- High school Certified	65	65	62	62		
Mother's work:						
- Housewife	75	75	81	81	χ2 =0.270	0.101
- Work outside home	25	25	19	19		
Child's sex:						
- Male	70	70	74	74	χ2 =4.6-5	0.11
- Female	30	30	26	26		

Child age/years:						
- 7-9	65	65	72	72	t.=0.451	0.532
- 10-12	45	45	28	28		
Mean ± SD	8.5 ± 1.4 years		8.4 ± 1.7 years			
Child rank:						
- First	50	50	60	60	χ2 =1.382	0.51
- Second	33	33	20	20		
- Third	17	17	20	20		
Place of residence:						
- Rural	75	75	71	71	χ2 =2.255	0.531
- Urban	25	25	29	29		
Does any family member smoke?						
- Yes	85	85	79	79	χ2 =2.755	0.191
- No	15	15	21	21		
Does any other family member have the same condition?						
- Yes	15	15	11	11	χ2 =1.455	0.514
- No	85	85	89	89		

*significant at P≤ 0.05, **highly significant at P ≤ 0.01, x2= chi-square.

Table.2 reveals that the signs and symptoms of the current attack of URTI appeared in less than three days' duration in (65% and 60%) of children in control and intervention groups, respectively. All children in both groups had taken medication before coming to hospital and all used warm fluids as a remedy at home; the highest percentage of them had taken analgesic-antipyretic (48% and 40%) in control and intervention groups, respectively. When the mother/caretaker was asked who prescribed the medication for your child, 25%, and 22% of them in the control and intervention groups respectively, responded no one. Sixty percent of children in the control and intervention groups were absent one day from the school because of the illness (mean ± SD = 1. 5 ± 0.29 day, and 1.4± 0.13 day), respectively. Chi- square test and t- test results showed that the control group and the intervention group were homogeneous in relation to the history of the disease (P >0.05).

Table-2: Current disease history of the children in control and intervention groups (n=200).

Variables	Control group, (n=100)		Intervention group, (n=100)		Test	P-value
	No	%	No	100		
Number of days of onset:						
- Less than three	65	65	60	60	χ2=1.39	0.51
- More than three	35	35	40	40		
Are you taking any medicine for the URTI?						
- Yes	100	100	100	100		
- No	00	00	00	00		
In case of yes, what is the medicine you take?						
- Antibiotic	20	20	16	16	χ2 =2.71	0.91
- Antipyretic	48	48	40	40		
- Mucolytic	32	32	44	44		
In case of yes, who prescribed the medicine for you?						
- No one (was taken in previous attack)	25	25	22	22		
- A relative	25	25	23	23		
- A neighbor	10	10	14	14	χ2 =0.102	0.25
- A pharmacist	25	25	23	23		
- A doctor	15	15	18	18		
Which home remedies do you use?						
- None	00	00	00	00		
- Warm fluids	100	100	100	100	χ2 =1.32	0.75
- Other	00	00	00	00		
Days absent from school:						
- One day	60	60	60	60		
- Two days	10	10	12	9		
- Three days	15	15	14	12		
- More than three days	15	15	14	14	t. =0.890	0.320
Mean ± SD	1. 5 ± 0.29 day		1.4± 0.13 day			

*Significant at P≤ 0.05, **highly significant at P ≤ 0.01, x2: chi-square.

Table.3 displayed that all children in the control group in the first day of study had sneezing, watery discharge, sore throat, and nasal blockage while 90% of them had cough, and 85% had headache and fever. However, half and slightly below half of the children (50%, 50%, 50%, 49.9% and 49%) had severe signs of nasal blockage, sneezing, watery discharges, cough and sore throat. Total mean ± SD scores of the signs and symptoms was 23.41±3.11, which represented severe level of signs and symptoms.

Table-3: Control group signs and symptoms of AURTI before starting the intervention (n=100).

Signs and Symptoms	Present				Degree of signs and symptoms					
	Yes		No		Mild		Moderate		Severe	
	No	%	No	%	No	%	No	%	No	%
Sneezing	100	100	00	00	14	14	36	36	50	50
Watery nasal discharge	100	100	00	00	10	10	40	40	50	50
Headache	85	85	15	15	35	41.1	27	31.8	23	27.1
Cough	90	90	10	10	19	21.1	27	30	44	49.9
Sore throat	100	100	00	00	7	7	44	44	49	49
Vomiting	10	10	90	90	10	100	00	00	00	00
Loss of appetite	10	10	90	90	10	100	00	00	00	00
Diarrhea	5	5	95	95	5	100	00	00	00	00
Fever	85	85	15	15	85	100	00	00	00	00
Nasal blockage	100	100	00	00	5	5	45	45	50	50
Mean ± SD	23.41±3.11									

Mild = (0-10), Moderate = (11-20), Severe = (21-30), SD= standard deviation.

Table.4 shows that all children in the intervention group and before starting the gargling with warm salty green tea had sneezing, watery discharge, sore throat, and nasal blockage while 90% of them had headache, cough and fever. Half and slightly above half of the children (55%, 52.3%, 52%, 51% and 50%) had severe signs of nasal blockage, cough, sneezing, watery discharges and sore throat. Total mean scores of the signs and symptoms was 22.351 ± 2.352, which represented severe level of signs and symptoms.

Table-4: Intervention group signs and symptoms of acute URTI before starting the intervention (n=100).

Signs and Symptoms	Present				Degree of signs and symptoms					
	Yes		No		Mild		Moderate		Severe	
	No	%	No	%	No	%	No	%	No	%
Sneezing	100	100	00	00	13	13	35	35	52	52
Watery nasal discharge	100	100	00	00	11	11	38	38	51	51
Headache	90	90	10	10	35	39	25	27.7	30	33.3
Cough	90	90	10	10	13	14.4	30	33.3	47	52.3
Sore throat	100	100	00	00	10	10	40	40	50	50
Vomiting	13	13	87	87	13	100	00	00	00	00
Loss of appetite	13	13	87	87	13	100	00	00	00	00
Diarrhea	9	9	91	91	9	100	00	00	00	00
Fever	90	90	10	10	85	94.4	5	5.6	00	00
Nasal blockage	100	100	00	00	00	00	45	45	55	55
Mean ± SD	22.351± 2.352									

Mild: (0-10), Moderate: (11-20), Severe: (21-30).

Table-5 indicated the absence of significant difference between the control group and the intervention group in relation to total mean score of signs and symptoms before start of the study with a t-test= 0.889, P= 0.311.

Table-5: Comparison between total mean score of signs and symptoms among children of control and intervention group before starting the intervention.

Items	Control Group (n=100)		Intervention Group (n=100)	
	Total Mean	SD	Total Mean	SD
Signs and Symptoms	23.41	3.11	22.351	2.352
t-test	0.889			
P- value	0.311			

*Significant at P≤ 0.05, **highly significant at P ≤ 0.01, SD: standard deviation.

Children in the control group showed watery nasal discharge, sore throat, headache, and cough and with 55%, 50%, 45%, and 45 % compared to three days after the usual routine care not including gargling with salty warm green tea. The total mean score of signs and symptoms was 15.15+2.131, which is considered moderate (**Table.6**).

Table-6: Control group signs and symptoms of acute URTI after three days of beginning the study (n=100).

Signs and Symptoms	Present				Degree of signs and symptoms					
	Yes		No		Mild		Moderate		Severe	
	No	%	No	%	No	%	No	%	No	%
Sneezing	40	40	60	60	10	25	20	50	10	25
Watery nasal discharge	55	55	45	45	25	45.5	25	45.5	5	9
Headache	45	45	55	55	35	77.7	10	32.3	00	00
Cough	45	45	55	55	16	35.5	27	60	2	4.5
Sore throat	50	50	50	50	30	60	15	30	5	10
Vomiting	00	00	100	100	00	00	00	00	00	00
Loss of appetite	00	00	100	100	00	00	00	00	00	00
Diarrhea	00	00	100	100	00	00	00	00	00	00
Fever	41	41	59	59	22	53.7	19	46.3	00	00
Nasal blockage	39	39	61	61	20	51.3	11	28.2	8	20.5
Total Mean ± SD	15.15±2.131									

Mild: (0-10), Moderate: (11-20), Severe: (21-30).

Table-7 demonstrates the drop of the percentage of children showing the signs and symptoms of URTI after three days of gargling with warm salty green tea with the highest recorded symptom to be fever and nasal blockage (41% and 39%, respectively), and absence of vomiting, loss of appetite and diarrhea. The total mean score was 12.165+2.66, which is considered moderate. **Table-8** illustrates that total mean signs and symptoms score was lower among children in the intervention group after three days of gargling with warm salty green tea compared to the scores of children in the control group with a highly significant difference (t-test=11.551, P=0.000).

Table-7: Intervention group children' signs and symptoms of acute URTI after three days of starting the intervention (n=100).

Signs and Symptoms	Present				Degree of signs and symptoms					
	Yes		No		Mild		Moderate		Severe	
	No	%	No	%	No	%	No	%	No	%
Sneezing	30	30	70	70	10	33.3	20	66.7	00	00
Watery nasal discharge	35	35	65	65	25	71.4	10	28.6	00	00
Headache	25	25	75	75	15	60	10	40	00	00
Cough	35	35	65	65	17	48.8	18	51.2	00	00
Sore throat	33	33	67	67	30	90.9	3	9.1	00	00
Vomiting	00	00	100	100	00	00	00	00	00	00
Loss of appetite	00	00	100	100	00	00	00	00	00	00
Diarrhea	00	00	100	100	00	00	00	00	00	00
Fever	41	41	59	59	22	53.6	19	46.4	00	00
Nasal blockage	39	39	61	61	29	74.4	10	25.6	00	00
Total Mean ± SD	12.165±2.66									

Mild: (0-10), Moderate: (11-20), Severe: (21-30), SD: standard deviation.

Table-8: Comparison between Total Mean Score of Signs and Symptoms among Children of Control and Intervention Group After Three Days of Starting Intervention (n=200).

Items	Control Group (n=100)		Intervention Group (n=100)	
	Total Mean	SD	Total Mean	SD
Signs and Symptoms	15.15	2.131	12.165	2.66
t-test	11.551			
P-value	0.000**			

*Significant at   P≤ 0.05, **highly significant at   P ≤ 0.01, SD: standard deviation.

Table-9 shows the presence of a positive and highly significant relationship between place of residence, child's sex, presence of a family member with the same condition, and presence of a smoking family member near the child from one side and total mean scores of signs and symptoms from the other side, both in control (r =0.612, 0.55, 0.88, and 0.731; P=0.000, 0.005, 0.05, and 0.000, respectively); and intervention group (r= 0.341, 0.65, 0.312, 0.671, and P=0.001, 0.000, 0.01, and 0.000, respectively). While the relation was significant and highly significant negative correlation between child age and the mean scores of signs and symptoms (in control group r =-0.98, and P= 0.05, in intervention group r = -0.151, P= 0.001).

Table-9: Correlation between the total mean score of signs and symptoms and selected demographic data of children in control and intervention groups (n=200).

Items	Control Group		Intervention Group	
	r	P-value	r. test	P-value
Place of residence	0.612	0.000*	0.341	0.001*
Child's sex	0.55	0.005*	0.65	0.000*
Child's age	-0.98	0.05*	-0.151	0.001*
Presence of a family member with the same condition	0.88	0.05*	0.312	0.01*
Presence of a smoking family member	0.731	0.000	0.671	0.000*

*Significant at   P≤ 0.05, **highly significant at P ≤ 0.01, r: Pearson correlation coefficient.

4- DISCUSSION

In the current study, we aimed to evaluate the effect of gargling with salty green tea on signs and symptoms of Acute Upper Respiratory Tract Infection (AURTI) among children. Our results showed that AURTI was more prominent in male than female in both control and intervention groups (74% and 70%, respectively) and that the mean age in both control and intervention group was (8.5 ± 1.4 years and 8.4 ± 1.7 years respectively). Rural area was the place of residence of the majority of children in control and intervention group. These findings of the current study match the same risk factor reported by Yousef and Hamed (2019) in their study of the prevalence of acute RTI among school age children and related risk factor (24). The symptoms of the condition started to appear less than three days before coming to hospital. These findings are similar to a study conducted in 2020 to detect causes and management of acute respiratory tract infections in primary health care facilities (25).

In the current study, the majority of children in the control and the intervention group had a smoking family member and most of them in both groups had no household contact that complained of the same condition. These findings are near to those of Zhuge et al. (2020) who studied effects of parental smoking on respiratory outcomes in children (26). In the current study, all children in both groups had taken medication before coming to hospital and all used warm fluids as a remedy at home. In a study done by Lucas et al (2019) on parental use of complementary medicine remedies and services for the management of respiratory tract infection in children the authors found that warm soup and warm herbal remedies such as tea are used by 78% of the parents to reduce symptoms of acute respiratory tract infections of their children (27). In the current study, we found that all children in the control and

the intervention groups had taken medications before coming to the hospital and without prescription; (48% and 40%, respectively) had taken antipyretic in control and when asked who prescribed the medication for you (25%) in the control group they responded no one, a relative and a pharmacist and in the intervention group 22%, 23% and 23% had the same responses respectively. These finding are not strange for Egyptian patients, either pediatrics or adults, and are homogeneous with Kasim and Hassan (2018) who reviewed the self-medication problem in Egypt and found that the problem occurs in 86.4% of Egyptian population (28).

This results also may be understood within the fact that population that is served in our hospital are of low socio-economic class and they cannot afford seeking the medical help in private clinics or hospitals and they tend to reuse the medication that has been prescribed to them or to their children or one of their relatives by a doctor or pharmacist to reduce the expenses they might have to pay if they seek the medical help in each attack of childhood illness. The current study showed that all children in control and intervention groups showed signs and symptoms of sneezing, watery discharge, sore throat, and nasal blockage before the start of the of study, followed by cough, headache and fever in the intervention group. These findings are of higher percentage than those of Yousef and Hamed (2015) who studied prevalence of acute respiratory infections of school age children and found that symptoms among their sample were runny nose (39.49%), cough (38.95%), fever (32.17%), and sore throat (27.93%) (24). However, the high percentages of the at hand study could be due to the difference in the setting of data collection. Yousef and Hamed (2015) (24) recruited their sample from schools and detected cases with early onset but our sample was recruited from hospital setting

and their symptom was severe to the point that it caused sixty of the children to be absent from school at least for one day for both control and intervention group. Also, almost one third of the sample in both control and study groups attended hospital after more than three days of signs and symptom starting and this is the time of URTI peak of symptoms. Children in the control group total mean score of signs and symptoms was (23.41± 3.11) before the start of study and became (15.15±2.131). These results could be totally understood in the light of the fact that those patients received paracetamol, which has the effect of reducing the symptoms of the common cold such as pain, fever, sneezing, etc. (29). Fever was present in (85% and 90%) of children in the control and intervention group when the study started and after three days the percentage of children with fever was 41% in both groups.

That result means that more children in the intervention group had no fever and this matches with the study of Noda et al. (2011), who found in their study on the effect of gargling with green tea on the development of fever among children aged 2-6 years that children who gargled with green tea had lower ratio of development of fever than those who do not (30). The total mean signs and symptoms score in the present study was lower among children in the intervention group after three days of gargling with warm salty green tea compared to the scores of children in the control group with a highly significant difference (t-test = 11.551, P= 0.000). Furushima et al. (2018), conducted a systematic review on the effect of green tea catechins on influenza infection and the common cold and found that among five clinical trial randomized studies that used gargling with green tea to prevent URTI, the incidence of URTI was lower in intervention group than control group but not significantly with a P≥0.05 (20). However, Ramalingam et al. (2019),

conducted a pilot, open labeled, randomized controlled trial of hypertonic saline gargling for the common cold and found that duration of illness was lower by 1.9 days (P = 0.01), transmission within household contacts by 35% (P = 0.006), and viral shedding by ≥0.5 log10/day (P = 0.04) (31).In this study, the effect of salty green tea can contribute to the results of the intervention group to the compound effect of the warmth (thermal effect), catechins effects in the green tea as anti-inflammatory agents (21, 30) as well as the effect of salt which helped in the reduction of both the edema resulting from inflammatory process as well as shedding off the virus as it is stated in the literature and this would explain the significant difference between the control and the intervention group mean score of signs and symptoms (31).

The current study showed that sore throat was lower among children in the intervention group (33%) after three days of gargling with warm salty green tea compared to the children in the control group (50%). These results are of scientific base as in a study of Onishiac et al. (2020) on the green tea catechins adsorbed on the murine pharyngeal mucosa that reduce influenza virus infection when ingested orally and the antiviral activity increased with the increased amount of catechins retained on the pharyngeal mucosa (P< 0.001) (32). In the current study, the children were asked to gargle with warm salty green tea every four hours and the main aim of gurgling was to keep green tea on the pharyngeal area for 30 seconds that leads to more absorption of catchiness that resulted in increased antiviral effect that reduced edema and pain in the throat. In addition, it was proven that the use of saline gargling in URTI shed the virus (31), and that may lead to the present findings of reduced sore throat especially when combined with the effect of green tea and salt. The presence of positive

highly significant correlation between place of residence, child's sex, presence of a family member with the same condition, and presence of a smoking family member near the child from one side, and the increased total mean signs and symptom scores as well as pain total mean scores due to sore throat in both control and intervention group are similar to the study of risk factors of reproductive tract infections (RTI) in the study of Yousef and Hamed (2015) (24).

5- CONCLUSION

The current study concluded that children with acute upper respiratory tract infections who gargle with warm salty green tea showed lower scores of sign and symptoms using than those children who did not.

6- RECOMMENDATION

We recommend the following:

1-   The use of green tea extracts in either the treatment or prevention of the upper respiratory tract infection of viral origin in children to reduce the use of medicines and the load on the hospitals as well as reduction of absentee days from schools.

2-   More awareness needs to be provided on self-medication hazards on children health.

3-   More educational instructions about negative impact of the presence of a smoking family member on the respiratory health of children.

4-   More researches need to be done on larger samples and more control over the extraneous variables to generalize its results on the population.

7- ACKNOWLEDGEMENTS

8- CONFLICT OF INTEREST: None.

9- REFERENCES

1. World Health Organization. WHO Global Epidemiological Surveillance Standards for Influenza (January, 2014).

2. Horton KC, Dueger EL, Kandeel A, AbdallatM., El-Kholy A, Al-Awaidy S, et al. Viral etiology, seasonality and severity of hospitalized patients with severe acute respiratory infections in the Eastern Mediterranean Region, 2007-2014. PLoS One. 2017;12:e0180954.

3. Hatem AM, Abuelhassan UE, Mohamed SA, Rizk MS, El-kholy A, Al-Harras M. Viral and atypical bacterial etiologies of severe acute respiratory infection (SARI) in Egyptian patients: epidemiological patterns and results from the sentinel surveillance study 2010–2014. Egypt J Chest Dis Tuberc 2019;68:88-95.

4. Bhutta, Z A, Chopra M, Axelson, H., Berman P, BoermaT., Bryce J, de Francisco, A. (Countdown to 2015 decade report (2000–10): taking stock of maternal, newborn, and child survival. Lancet. 2010, 375 (9730): 2032-44. Doi.10.1016/S0140-6736(10)60678-2.

5. El-Zanaty F, Way A. Egypt Demographic and Health Survey 2014. Cairo, Egypt: Ministry of Health, El-Zanaty and Associates, and Macro International, 2015.

6. Walter J M, Wunderink RG. Severe respiratory viral infections: new evidence and changing paradigms. Infectious Disease Clinics of North America. 2017; 31(3): 455-74.

7. European Centre for Disease Prevention and Control (ECDC), European Food Safety Authority (EFSA), & European Medicines Agency (EMA). ECDC/EFSA/EMA second joint report on the integrated analysis of the consumption of antimicrobial agents and occurrence of antimicrobial resistance in bacteria from humans and food-producing animals: Joint Interagency Antimicrobial Consumption and Resistance Analysis

(JIACRA) Report. EFSA Journal. 2017; 15(7): e04872.

8. O'Neil J. Tackling drug-resistant infections globally: final report and recommendations. In: Ro A, ed. Resistance. London, United Kingdom: 2016; 1: 84.

9. Mendelson M, Matsoso MP. The World Health Organization global action plan for antimicrobial resistance. SAMJ: South African Medical Journal. 2015; 105(5):325-25.

10. Smith E, Lichten CA, Taylor J, MacLure C, Lepetit L, Harte E, et al. Evaluation of the EC action plan against the rising threats from antimicrobial resistance. European Commission, Brussels, 2016. Available at: https://ec.europa.eu/health/amr/sites/amr/files/amr_final-report_2016_rand.pdf. (Accessed 13March, 2020).

11. Kok ET, Jong MJ, Gravendeel B, van Leeuwen WB, Baars E W. Resistance to antibiotics and antifungal medicinal products: Can complementary and alternative medicine help solve the problem in infection diseases? The introduction of a Dutch research consortium. EVID Based Complement Alternat Med. 2015; 2015: 521584.

12. Allan GM, Arroll, B. Prevention and treatment of the common cold: making sense of the evidence. CMAJ. 2014; 186(3): 190-99.

13. Ramalingam S, Cai B, Wong J, Twomey M, Chen R, Fu RM, Boote T, McCaughan H, Griffiths SJ, Haas JG4.Antiviral innate immune response in non-myeloid cells is augmented by chloride ions via an increase in intracellular hypochlorous acid levels. Sci Rep. 2018;8(1):13630.

14. King D, Mitchell B, Williams C P, &Spurling G K (2015). Saline nasal irrigation for acute upper respiratory tract infections. Cochrane Database of Systematic Reviews, 2015;(4):CD006821.

15. Köksal T, Cizmeci M N, Bozkaya D, Kanburoğlu M K, Şahin Ş, Taş T, et al. Comparison between the use of saline and seawater for nasal obstruction in children under 2 years of age with acute upper respiratory infection. Turkish journal of medical sciences, 2016; 46(4):1004-13.

16. Liang Y R, Liu C, Xiang L P, and Zheng X Q. Health benefits of theanine in green tea: A review. Tropical Journal of Pharmaceutical Research. 2015; 14(10): 1943-49.

17. Reygaert W C. An update on the health benefits of green tea. Beverages, 2017;3(1): 6.

18. Liu Y, He C, Li H, Xu F, Feng L, and Xie H. Application of comprehensive airway nursing management in the treatment of children with respiratory tract infections. Int J ClinExp Med.2018; 11(9): 9905-10.

19. Bruce C S, Hoare C, Mukherjee A, and Paul S P. Managing acute respiratory tract infections in children. British Journal of Nursing. 2017; 26(11): 602-9.

20. Furushima D, Ide K, Yamada H. Effect of tea catechins on influenza infection and the common cold with a focus on epidemiological/clinical studies. Molecules. 2018; 23(7): 1795.

21. Polit D, Beck C. Essentials of nursing research: Appraising evidence for nursing practice. 7th. ed., Lippincott and Williams, London, 2017.

22. Ide K, Kawasaki Y, Kawakami K, Yamada H. Anti-influenza virus effects of catechins: A molecular and clinical review. Curr. Med. Chem. 2016, 23, 4773–483.

23. Stuttgart G. How Should We Measure Body Temperature in the Pediatric Emergency Department? Which One Is the MostAccurate?.JPediatr Infect Dis. 2019; 14(03): 121-126

24. Yousef FM, Hamed AF. Prevalence of acute respiratory infection and related risk factors in school age children in Egypt: A cross-sectional study. Int J Curr Res Med Sci. 2016; 2: 50-8.

25. El-Gamal F, Alaslani M, Alsaadi A, and Alaslani H H. Causes and management of acute respiratory infections in primary health care. Middle East Journal of Family Medicine,2020; 18(1):124-31.

26. Zhuge Y, Qian H, Zheng X, Huang C, Zhang Y, Li B, Zhao Z, et al.. Effects of parental smoking and indoor tobacco smoke exposure on respiratory outcomes in children. Scientific Reports. 2020; 10(1): 1-9.

27. Lucas S, Kumar S, Leach M J, and Phillips A. Parent use of complementary medicine remedies and services for the management of respiratory tract infection in children: a qualitative study. Journal of Multidisciplinary Healthcare.2109; 12: 749.

28. Kasim K, and Hassan H. Self medication problem in Egypt: a review of current and future perspective. Int J Cur Res Rev. 2018; 10(4): 40-5.

29. Seifert G, Brandes-Schramm J, Zimmermann A, Lehmacher W, and Kamin W. Faster recovery and reduced paracetamol use–a meta-analysis of EPs 7630 in children with acute respiratory tract infections. BMC pediatrics.2019; 19(1): 119-25.

30. Noda T, Ojima T, Hayasaka S, Murata C, Hagihara A. Gargling for oral hygiene and the development of fever in childhood: a population study in Japan. Journal of epidemiology. 2012; 22(1):45-49.

31. Ramalingam S, Graham C, Dove J, Morrice L, and Sheikh A. A pilot, open labelled, randomised controlled trial of hypertonic saline nasal irrigation and gargling for the common cold. Scientific reports. 2019; 9(1): 1-11.

32. Onishi S, Mori T, Kanbara H, Habe T, Ota N, Kurebayashi Y, and Suzuki T. Green tea catechins adsorbed on the murine pharyngeal mucosa reduce influenza a virus infection. Journal of Functional Foods. 2020; 68(103894):1-8.