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The Danger of Sodium Benzoate in Soft Drinks as A Preservative

Abuajela, A. A. Abdulmalika Wedad, A. A. Ahmedb
College of Science/Sabratha University, Libya.

خطر بنزوات الصوديوم في المشروبات الغازية كمادة حافظة

أبوعجيلة الهادي ابوالقاسم عبد الملك وداد علي العجيلي أحمد
قسم الكيمياء ،كلية العلوم، جامعة صبراتة، ليبيا

Abstrac

It is not easy for people to stop consuming food rich in preservatives, but everyone can limit them. In the world of food industries, Natural preservatives are the key element in maintaining the highest levels of healthy production of various foods. Industrial preservatives are chemicals used to preserve fresh food and extend its life for a longer period. Artificial preservatives contain types that slow down the ripening process. This paper aims to illustrate some of the evidence showing the cancer risks caused by sodium benzoate as a chemical preservative. In the food chain, when a person takes sodium benzoate, which is found in the components of "non-alcoholic soft drinks", the body begins to interact with it, and then damage occurs in the human body. The "European Food Safety Authority" (EFSA) and the "US Environmental Protection Agency" (USEPA), Health risks are clarified about food safety. According to (WHO), there are also indications confirm the possibility of the presence of benzene in our food chains. These indicators require product quality and safety monitoring to ensure compliance with standards. Based on the "Food and Agriculture Organization" and the "World Health Organization" (FAO/WHO), the tolerable daily intake for food additives of benzoate salts was compared.

Keywords: Chemical Preservatives, Sodium Benzoate, Cancer, Soft Drinks.

ملخص البحث

ليس من السهل على البشر التوقف عن تناول الأطعمة الغنية بالمواد الحافظة، ولكن يمكن للجميع الحد منها. في عالم الصناعات الغذائية، تعتبر المواد الحافظة الطبيعية العنصر الأساسي في الحفاظ على أعلى مستويات الإنتاج الصحي لمختلف الأطعمة. المواد الحافظة الصناعية هي مواد كيميائية تستخدم لحفظ الطعام الطازج وإطالة عمره لفترة أطول. تحتوي المواد الحافظة الاصطناعية على أنواع تعمل على إبطاء عملية النضج. تهدف هذه الورقة إلى توضيح بعض الأدلة التي توضح مخاطر الإصابة بالسرطان التي يسببها بنزوات الصوديوم كمادة حافظة كيميائية. في السلسلة الغذائية، عندما يتناول الشخص بنزوات الصوديوم، والتي توجد في مكونات "المشروبات الغازية غير الكحولية"، يبدأ الجسم في التفاعل معها، ثم يحدث تلف في جسم الإنسان. اعتمادًا على "هيئة سلامة الأغذية الأوروبية (EFSA) "و "وكالة حماية البيئة الأمريكية (USEPA) "، تم توضيح المخاطر الصحية حول سلامة الأغذية. وبحسب منظمة الصحة العالمي (WHO) ، هناك أيضًا مؤشرات تؤكد إمكانية وجود البنزين في سلاسلنا الغذائية. تتطلب هذه المؤشرات مراقبة جودة المنتج وسلامته لضمان الامتثال للمعايير. بناءً على "منظمة الأغذية والزراعة" و "منظمة الصحة العالمية(FAO/WHO) "، تم مقارنة المدخول اليومي المسموح به من المضافات الغذائية لأملاح البنزوات.

الكلمات المفتاحية:بنزوات الصوديوم، سرطان، مشروبات غازية، مواد حافظة كيميائية.

Introduction

In the world of food industries, natural preservatives [1–3] are the key element in maintaining the highest levels of healthy productivity for various foods, such as using the temperature factor in meat and dates [4] for drying and other factors. In order to complete the drying process, a water activity agent [5–7] must be used, which is one of the main factors for the purpose of activating microorganisms. This factor has a value between zero and one. Whenever the water activity of the growth of microorganisms [7], [8] such as bacteria is at a value less than one, the activity of these organisms is inhibited and the food material is preserved. Industrial preservatives [5], [9] are chemicals used to keep food fresh. Also, They extend the life of this food for a long period, and the consumer can use it at the specified time. Artificial preservatives have types that slow the ripening process, such as antimicrobials.[10], [8], [11] Although industrial preservatives cause many health problems

for humans, [5] many global partners are still continuing to produce them.

Sodium Benzoate

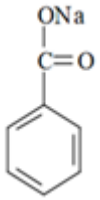

Fig. 1: Shows the chemical structure of sodium benzoate. [12,13]

In fig. 1, sodium benzoate is one of the preservatives that are added at an allowable value as a preservative in drinks. When a person consumes these drinks, the body begins to react with sodium benzoate, which turns into a carcinogenic organic compound. [6], [14], [15] This carcinogenic organic compound is called benzene, which is more dangerous than benzoate and causes harm to the human body. According to the "World Health Organization", there are also indications confirm the presence of benzene in our food chains. [6],[16] Because benzene is a carcinogen, these indicators require product quality and safety monitoring to ensure compliance with standards.[15], [17]

The responsibility of evaluating the safety of food additives [15] is one of the main duties of the Scientific Committee for Food (SCF).[3] This committee has set codes for "chemicals that can be used as food additives" that have been adopted all over the world. The code E, accompanying numbers starting from 200 to 299, has been adopted as a code for the "preservatives category". For example, the symbol for sodium benzoate is among these symbols shown in Table 1.[3]

Table 1: This table shows the "preservative category code" for Sodium Benzoate.[3]

E-Number	Name of Preservative
E 200	Sorbic acid
E 202	Potassium sorbate
E 203	Calcium sorbate
E 210	Benzoic acid

E 211	Sodium benzoate
E 212	Potassium benzoate
E 213	Calcium benzoate
E 214	Ethyl p–hydroxybenzoate
E 215	Sodium ethyl
E 216	p–hydroxybenzoate
E 217	Propyl p–hydroxybenzoate
E 218	Sodium propyl
	p–hydroxybenzoate
	Methl p–hydroxybenzoate

Cancer is one of the main diseases that cause a shortening of life expectancy and a cause of death around the world. [2], [6], [18] According to estimates by the World Health Organization in 2015, an estimated 8.8 million deaths occurred. [2],[19] This number is still increasing to the present day. Available statistics from GLOBOCAN indicate that in 2020, the high incidence of cancer was estimated at 19.3 million cases globally. [20]

These values "(HQ>1, MoE<104 and LTCR >10−6)" have serious indications that there is a danger to public health. [2],[15] When estimating health risks about food safety, the following values should be compared. The European Food Safety Authority (EFSA) and the US Environmental Protection Agency (USEPA) state that the "Hazard Quotient (HQ > 1)" is a quantitative measure that determines how much humans are exposed to benzene. If this scale exceeds the permissible values, it becomes a significant risk and requires a public health concern. [2] The risk of "carcinogenicity and nontoxicity" can be

calculated using the "margin of expo-sure" (MoE) by following the guidelines of the European Food Safety Authority (EFSA). These guidelines show that there is no fear of health when the "margin of expo-sure" (MoE) is less than $10{,}000$. However, if these values are the opposite, human health becomes threatened. [2],[15]

"The minimum Life Time Cancer Risk" (LTCR) calculation is 10^{-6}, but if this calculated value is exceeded, this leads to cancer.[2],[19] For example, when adding benzoic acid salts and benzoate salts to "non-alcoholic soft drinks" as a preservative, attention must be paid to the provisions of the Food and Agriculture Organization and the World Health Organization (FAO/WHO). "The chronic dietary intake" (CDI) ranges from $0-5$ mg/kg (body weight). [2] This allowable limit allows to ensure the safety of consumers.

The benzene found in soft drinks can be produced from the gradual decomposition reaction that occurs in sodium benzoate. [2], [15], [17], [18], [21] Thus, the longer the product remains without consumption, the more likely it is that benzene will be formed from sodium benzoate. [2], [16],[14], [15], [17], [22] Benzene tends to accumulate in human tissues over a relatively long period, it is bound to have a serious public health impact such as cancer, attention-deficit disorder, and other health problems. [14], [15] According to the World Health Organization, the value of 10 μg/liter is the standard reference value, after which this value indicates that benzene becomes dangerous and causes cancer to consumers. [16], [17] "5 μg/L and 1 μg/L" are standard values and standards established by USEPA and the European Commission respectively for non-alcoholic carbonated drinking water. [2], [16]

There are factors that cause the formation of benzene inside soft drinks. These samples of water samples and soft drinks containing sodium benzoate and ascorbic acid have been used in many studies. In order to confirm that benzene is produced from sodium benzoate in the presence of some factors such as heat and light, external factors and storage time were examined.[15-17] The concentrations of benzene formed in beverage samples for a number of studies were shown in the following table 2.

Table (2): Shows the factors that cause the formation of benzene in samples of water samples and soft drinks containing sodium benzoate and ascorbic acid.[15,22]

Sample	Temperature and Light	Storage Time	Co. of Benzene Formation	References
0.025% ascorbic acid, 0.04% sodium benzoate, copper and andiron ions	45◦C Intense UV light	20 hours	300 ng/g	McNeal et al.
	25◦C In the dark	20 hours	4 ng/g	
	25◦C In the dark	8 days	266 ng/g	
0.025% ascorbic acid and 0.04% sodium benzoate	No Temperature In the dark	8 days	76ng/g	Chang and Ku
0.025% ascorbic acid and 0.04% sodium benzoate + without adding ions	25◦C	12 hours	<0.1μg/L	Aprea et al.
	25◦C	After 70 hours	0.44μg/L	
	45◦C	After 24 hours	118.5μg/L	

	45◦C	After 48 hours	125μg/L	
Soft Drink Sample	25◦C	21 days	(Ranging from 0.7 ppb to 1.5 ppb)	Morsiet et al.
	45◦C	21 days	(Ranging from 5.5 ppb to 6.6 ppb)	
	90◦C	21 days	(Ranging from 25 ppb to 55.1 ppb)	

When a person is exposed to benzene through the sense of smell, the human body absorbs about 50% of it. [15] This percentage is considered less than the percentage of the body's exposure to the absorption of benzene found in food, which is equal to 100%. [15] Therefore, it is not easy to make an accurate assessment that explains the amount of human exposure to benzene, because the food consumed has a large variance in the concentration of benzene. [2]

Results and discussions

In a study conducted by Azuma, all data for the target subjects (male and female) were recorded, including age, weight, gender, …. etc. Samples were taken from non-alcoholic soft drinks and HPLC technology was used for the purpose of analysis. [2] All data are shown in Table 3. Equations were used to calculate the following values: "(CDI) The chronic dietary intake, (MoE) The margin of exposure, and The hazard quotient (HQ)".

"Equation 1" was used to calculate the chronic dietary intake (CDI) as follows:

$$CDI = \frac{C_H \times V_D \times EF \times ED}{B_W \times A_T} \quad \text{.....1}$$

"(CH) mg/g is the hazard concentration, (VD) mg/L total volume of non-alcoholic drinks per day, (EF) exposure frequency days/year, (ED) exposure duration in years, (BW) body weight in kg, (AT) averaging time". [2]

"Equation 2" was used to obtain non-carcinogenic or carcinogenic exposures for ages 30 years or 70 as follows:

$$MoE = \frac{BMDL_{10}}{CDI} \quad \text{.....2}$$

ABMDL10 (bench mark dose lower limit) as known value. The potency factor (PF) for benzene1 and reference dose (RfD) are also used as known value to determine Equation 3,4. [2]

$$HQ = \frac{CDI}{RfD} \quad \text{.....3}$$

$$R = CDI \times PF \quad \text{.....4}$$

The results of the study showed in table 3 that the concentrations of sodium benzoate ranged between "51.0 mg/L as a minimum and 277.0 mg/L" as a maximum. Based on the recommendations of the US

Environmental Protection Agency, these high concentrations were compared with the acceptable limit values of 150 mg/L were higher than the acceptable limit. [2]

Table (3): shows the statistical results of sodium benzoate for both males and females.[2]

	Variable	Statistical distribution	Central tendency metrics				Percentiles		
			Min	Max	Mean	Mode	5^{th}	50^{th}	95^{th}
Males	Benzoate (mg/L)	Laplace (131.5346.48.9716)	5.1	277.0	131.5	131.2	131.5	51.8	211.3
	V_D (L)	Pareto (1.8195.0.2000)	0.2	1.5	0.4	0.2	0.3	0.2	1.0
	EF (days/year)	Uniform (6.8841.370.12)	12.0	365.0	188.5	85.0	188.5	25.1	352.0
	ED (years)	Uniform (4.7101.25.290)	5.0	25.0	15.0	7.9	15.0	5.7	24.3
Bw (kg)		Loglogistic (50.176.23.807.2.8282)	55.0	188.0	79.7	68.6	74.0	58.6	117.6
Females	Benzoate (mg/L)	Laplace (131.5346.48.9716)	5.1	277.0	131.5	131.9	131.5	51.8	211.3
	V_D (L)	ExponAlt (0.16686.0.19612)	0.2	0.9	0.4	0.2	0.3	0.2	0.7
	EF (days/year)	Uniform (3.5952.373.40)	12.0	365.0	188.5	183.0	188.5	22.1	355
	ED (years)	Uniform (4.5238.25.476)	5.0	25.0	15.0	25.0	15.0	5.6	24.4
Bw (kg)		Triang (49.49.94.069)	49.0	90.0	64.0	49.1	62.2	50.1	84.0

The amount of sodium benzoate to which both male and female were exposed to was "131.2 mg/L and 131.9 mg/L", respectively shone in Table 3. [2] The maximum daily volume drunk equal to 95 percent was distributed to females and males. [2] 183 days a year is the female exposure value. This value is greater than the male exposure value of 85 days/year. Also, females recorded a longer exposure frequency with a value equal to more than 25 years, while males with a value equal to 7.9 years. Based on Human Exposure Characterization (HEXPOC) the chronic daily intake value of benzoate set at 3 to 50 ng/kg (body weight) is the maximum value for human dietary exposure to benzoates. When this maximum value was compared to the chronic daily intake of

benzoate for this study, a value ranging from 0.0025 to 82.89 mg/kg (body weight) indicates a higher benzene accumulation. It is shown in Table 4. [2]

Table (4): Indicates the potential values of causative or non-carcinogenic chronic food exposure.[2]

		Central tendency metrics				Percentiles		
	Variable	Min	Max	Mean	Mode	5th	50th	95th
Males	CDI (non-cancer)	0	82.89	0.199	0.014	0.009	0.111	0.598
	CDI (cancer)	0	18.97	0.085	0.005	0.004	0.048	0.256
	Hazard Quotient	0	24.7×10^{3}	50.03	7.37	2.44	27.68	148.97
	MoE	0	11×10^{6}	1106.50	142.01	59.67	358.38	3512.78
	LTCR	0	0.61	1.8×10^{-3}	5.6×10^{-5}	6.2×10^{-5}	7.2×10^{-4}	3.8×10^{-3}
Females	CDI (non-cancer)	0	0.838	0.096	0.0064	0.0058	0.073	0.265
	CDI (cancer)	0	0.395	0.041	0.0032	0.0025	0.031	0.113
	Hazard Quotient	0	222.58	23.94	1.95	1.48	18.18	66.19
	MoE	0	10.2×10^{6}	1647.16	245.58	145.20	546.00	5616.06
	LTCR	0	6.3×10^{-3}	6.1×10^{-4}	1.7×10^{-5}	3.7×10^{-5}	4.7×10^{-4}	1.7×10^{-3}

Conclusion

In spite of all the strict precautions by the organizations regarding adherence to standard standards, human exposure to chemicals continues to this day. The values of the chronic daily intake of benzoate set at "3 to 50 ng/kg (body weight)" is the maximum human dietary exposure value for sodium benzoate based on (HEXPOC). The more people consume canned food, the more preservatives accumulate in our bodies and the risk of disease becomes higher. The best evidence of the alarming increase in the incidence of cancer and other comorbidities associated with poor eating habits is modern societies. In addition, this phenomenon in which processed foods are incorporated into the daily diet is a means for the advancement of the economy in the country. In an effort to counter this threat, much attention has been paid to the amount of preservatives and the allowable limit in soft drinks.

Specifically, the external and internal factors that affect beverages are the main problems that stand against industrial preservatives. Although the harmful effects of sodium benzoate are undeniable, processed foods are made up of many other substances. Also, despite the health risk indicators that were greater than the permissible limit, the application of sodium benzoate in food was legally applied and continues to this day.

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Isolation and antimicrobial susceptibility patterns of bacterial pathogen causing Tonsillitis in school children aged between 7-10 years in ALryayna, Nalut and Yefern cities.

Aiman A Alazzabi. Somia A Altaleb . Saeed A Wareg

Medical technology college medical lab department

university of Nalut

Abstrac

Acute pharyngeal tonsillitis infection has been given a lot of attention, and there are many publications in the literature that deal with different facts of the condition.

Tonsillitis is an inflammation of the tonsils that is commonly seen in Eyes, Nose, and Throat departments. Acute tonsillitis diagnosis and treatment is one of the most prevalent problems seen at otorhinolaryngology clinics in both adults and children.(1)

Tonsillitis is the most common disease in throat that occurs predominantly in the younger age group. The most common cause of acute supportive tonsillitis include group A, B-hemolytic streptococci. Invasive group A streptococcus infections cause 1,100 to 1.300 deaths annually in the united states.(2)

The treatment of the illness is frequently empirical especially with antibiotics prescribed without culture results. Despite the fact that tonsillitis is extremely prevalent, there appears to be no consensus on the primary causing organism. Resistance is becoming more common in many organisms due to the synthesis of B-lactamase and the transmission of resistance genes that lead to unsuccessful medical therapy which results in recurrent or chronic forms of tonsillitis.(3)

The present study was aimed to identify the most common bacterial infections that cause tonsillitis in children in specified age groups(7 to 10 years) and study their antibiotic sensitivity pattern to assess the most effective treatment regimen that can be administered to avoid unnecessary surgery. One hundred and thirty six tonsil swabs were taken from the school of children, aged between 7 to 10 years, The percentage of bacteria which was isolated from the samples represented 23.5% for *S. epidermidis* , 21.3% for *S.aureus*,5.9% for

S.pneumonia,5.1% for *S.agalactiae*,1.5% for *C. diphtheria*, 0.7% for *S . pyogenes*, While,21.3% were having more than one type of bacteria and 20.6% were not infected by any of those types of bacteria.

Keywords: Bacterial tonsillitis, antibiotic resistance, antimicrobial susceptibility

Introduction

Pharyngitis and tonsillitis are two common upper respiratory infections that cause illness in children visiting their primary care physician. Although viral causes account for the majority of instances of pharyngitis/tonsillitis, bacterial causes are noteworthy due to non-supportive sequelae such as rheumatic fever and rheumatic heart disease associated with group A (B- hemolytic) streptococcus infection.(4).(14)

Tonsillitis is an inflammation of the tonsils that can be caused by a bacterial or viral infection. It affects a sizable portion of the population, particularly youngsters. The condition can happen once in a while or on a regular basis. Acute tonsillitis is characterized by visible white pus streaks on the tonsils, and the surface of the tonsils may turn red.(5).(15).

B –hemolytic streptococcus, as well as a *staphylococcus aureus* and several other bacteria, are the most common causes of bacterial tonsillitis. A painful throat, red swollen tonsils, pain when swallowing, fever, cough, headache, weariness, and chills are the most frequent symptoms of tonsillitis. Swollen lymph nodes in the neck and pain in the ears or neck are frequent symptoms, although nausea, stomach ache,

vomiting, fuzzy tongue, poor breath, change in voice, and trouble opening the mouth are less common(6).(10)

Severe systemic symptoms of group A (B-hemolytic) streptococci infections are due to septicemia or production of extracellular toxins(7).(11) Invasive Group A streptococuss infection usually is defined by the isolation of *S pyogenes* from pus, blood, or other body fluids obtained by sterile means. However, *S pyogenes* might not be isolated if antibiotics were administered before culture samples were obtained or if symptoms are secondary to toxin production (8).(12) The composition of normal commensal bacteria of oropharynx and nose, i.e Viridans streptococci, Bacteriods, Fusobacteria, Spirochaetes, Lactobacilli, Veillonella and other anaerobic cocci may be disrupted by frequent use of broad-spectrum antimicrobials, by inhibiting sensitive organisms and allowing overgrowth of the resistant ones. This may cause serious infection by the normal commensals (9).(13)

The present study was aimed to identify the prevalent pathogenic bacteria and their antibiotics sensitivity that may indicate the optimum line of treatment and prevent the complication of acute tonsillitis.

Materials and Methods

Ethical approval was obtained from the local research ethics committee of Nalut

Hospital, and all participant were given informed written consent before the study. This study included one hundred and thirty six children with age range from 7 to 10 years. Throat swabs were collected from

each child for bacteriological examination and isolation of the pathogenic bacteria.

The bacteriological identification was carried out in the department of Microbiology, Nalut Hospital from February to July 2019. A total of 136 samples were collected throughout the course of six months, The chosen children were not given antibiotics for one week prior to the study. Blood and MacConkey agar plates were used to cultivate throat swabs. Gram staining, biochemical assays (catalase, coagulase, DNase, oxidase, urease, citrate, and triple sugar iron), and the API system were used to identify bacteria (API 20E and API 20NE).

The Modified Kirby Bauer disc diffusion technique was used to test antimicrobial sensitivity on Mueller Hinton agar. A 0.5 McFarland turbidity standard was used to compare the test inoculum. For Gram negative bacteria, acceptable antimicrobial discs included amoxicillin/clavulanic acid (AMC), amikacin (AK), cefuroxime (CXM), ceftazidime (CAZ), ceftriaxone (CRO), cefotaxime (CTX), ciprofloxacin (CIP), chloramphenicol (CHL), meropenem (MEM), piperacillin/ tazobactam (TZP (SCF.(

Antimicrobial discs used for Gram positive bacteria were amoxicillin/clavulanic acid (AMC), amikacin (AK ampicillin (AMP), penicillin (P), oxacillin (OX،(

ciprofloxacin (CIP), vancomycin (VAN piperacillin/tazobactam (TZP), ceftriaxone (CRO cefotaxime (CTX), cefuroxime (CXM) and cefradine)CE).

, the plates were incubated at 37oC for 18–24 hours.

Using an interpretation chart of zone sizes, the zone sizes of each antimicrobial disc against each organism were measured in mm and classified as sensitive, resistant, or intermediate sensitive according Chsi standads.

Results

One hundred and thirty six samples were collected from the school children s aged between 7 years to 10 years with majority of males. Samples represented, 72(52.9%) were males while 64 (47.1%) were females.54 (39.7%) of the samples were from Alryayna, 49 (36%) were from Nalut and 33 (24.3%) were from Yefren .

The percentage of bacteria which were isolated from the samples were 23.5% for *S.epidermids* ,21.3% for *S.aureus*,5.9% for *S.pneumonia*,5.1% for *S.agalactiae*,1.5% for *C. diphtheriae*, 0.7% for *S.pyogenes*, .While,21.3% were having more than one type of bacteria and 20.6% were not infected by any of those types of bacteria. Figure (1)

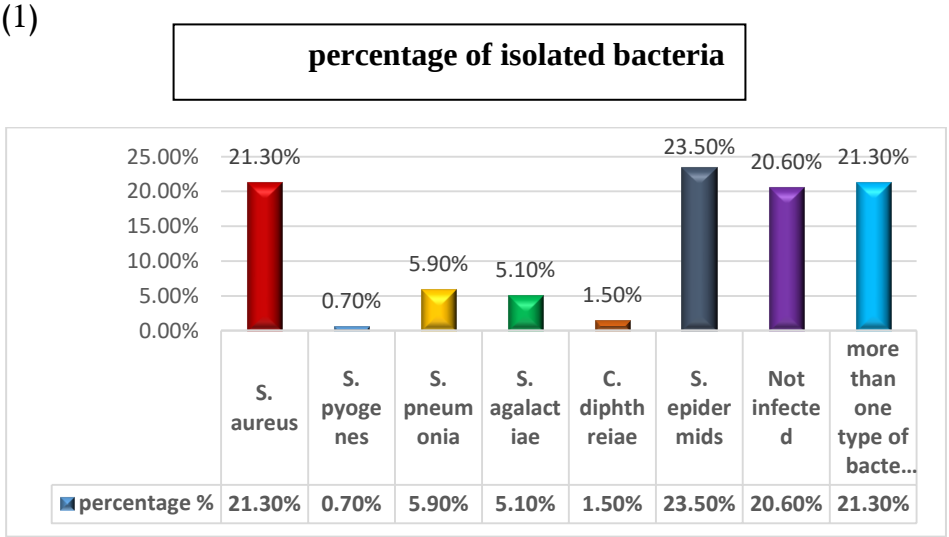


Figure 1 the percentage of isolated bacteria

Eleven of the male samples and 18 of the female samples were infected by *S.aureus*, 5 males and 3 females were infected by *S.pneumonia*, 4 males and 3 females were infected by *S. agalactia*æ,23 males and 9 females were infected by S*.epidermids*. Non of the female and 1 male samples were infected by *S.pyogenes*, while *corynebacterium* were found in 2 female samples and not found in male samples. perhaps, 13 males and 16 females were having more than one type of bacteria. Finally, 15 males and 13 females were not infected by any of those types of bacteria. Figure (2)

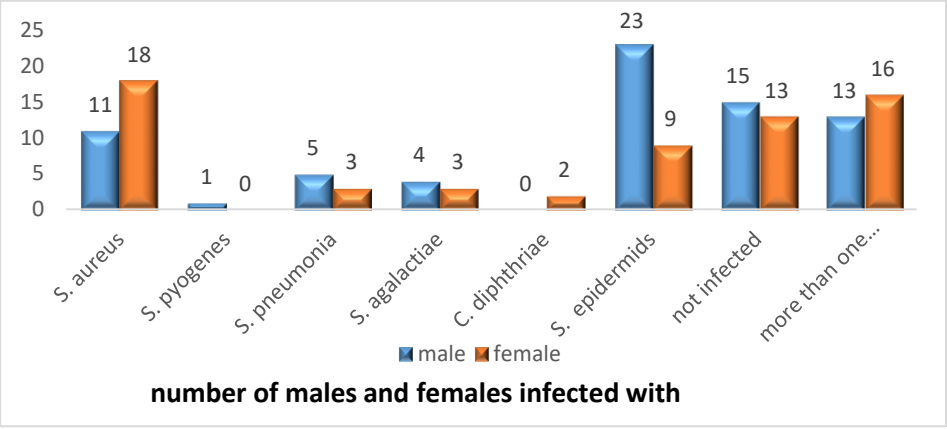
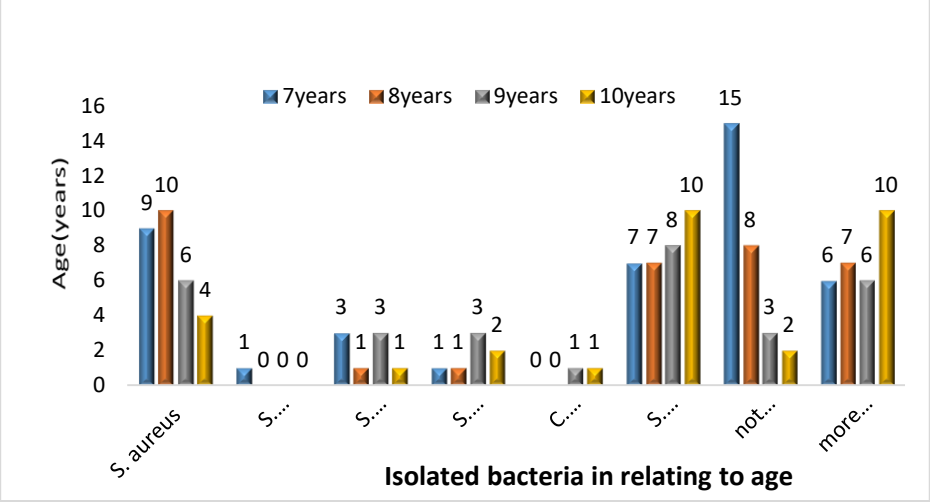


Figure 2 the number of males and females infected with bacteria

S.aureus was isolated in 9 samlpes aged 7 years, 10 samples in 8 years, 6 samples in 9 years, and 4 samples in 10 years. *S.pyogenes* found in 1 sample aged 7 years, and non-samples isolated from ages of 8year , 9 years and 10 years. *S.pueumonia* found in 3 samples aged 7 years, 1 sample in 8 years, 3 samples in 9 years, and 1 sample in 10 years. *S. agalactiae* found in 1 sample each 7 year and 8 years, 3

samples in 9 years and 2 samples in 10 years. *C.diphtheriae* were not found in 7 and 8 years, and found in 9 and 10 years in 1 sample each. *S.epidermids* were found in 7 samples aged 7 years, 7 samples in age of 8 years, 8 samples in age of 9 years, and 10 samples in 10 years. Samples having more than one type of bacteria were found in 6 samples in age of 7 years , 7 samples in 8 years, 6 samples in 9 years,10 samples in 10 years. The non-infected samples were found in 15 samples in age of 7 years , 8 samples in 8 years, 3 samples in 9 years,2 samples in 10 years. Figure(3).



.Figur 3 The isolated bacteria in relation to age

Staphylococcus aureus was sensitive to penicillin 92%, followed by 51% to Tetracycline. Streptococcus pyogens was sensitive to oxacillin by 100% followed by 71% to penicillin. Streptococcus pneumonia was sensitive to chloramphenicol 69% followed by 62% oxacillin. Staphylococcus epidermids was sensitive to penicillin by 78%. Streptococuus agalactie was sensitive to penicillin by 84% followed by

84% to chloramphenicol and 92% oxacillin. Haemophilus influenza was sensitive to 100% penicillin, followed by 80% to tetracycline and oxacilline. Corynebacterium dipheteria was sensitive to 60% chloramphenicol and oxacillin.(figure 4)

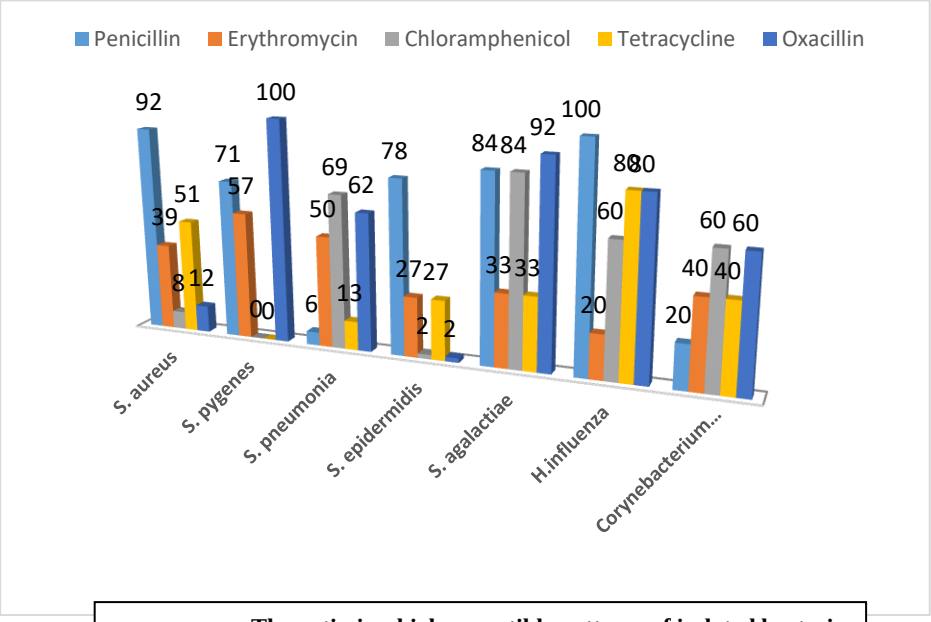


figure 4.The antimicrobial susceptible patterns of isolated bacteria

Staphylococcus aureus was resistance to chloramphenicol 92%, followed by 88% to oxacilline. Streptococcus pyogens showed no resistance to any antibiotics. Streptococcus pneumonia was resistance to penicilline 94% followed by 69% Tetracycline. Staphylococcus epidermids was resistance to chloramphenicol and oxacilli by 98%. Streptococuus agalactie showed no resistance. Haemophilus influenza

was resistance to Erythromycin by 60%. Corynebacterium dipheteria was resistance to only penicillin antibiotic by 80%. Figure (5).

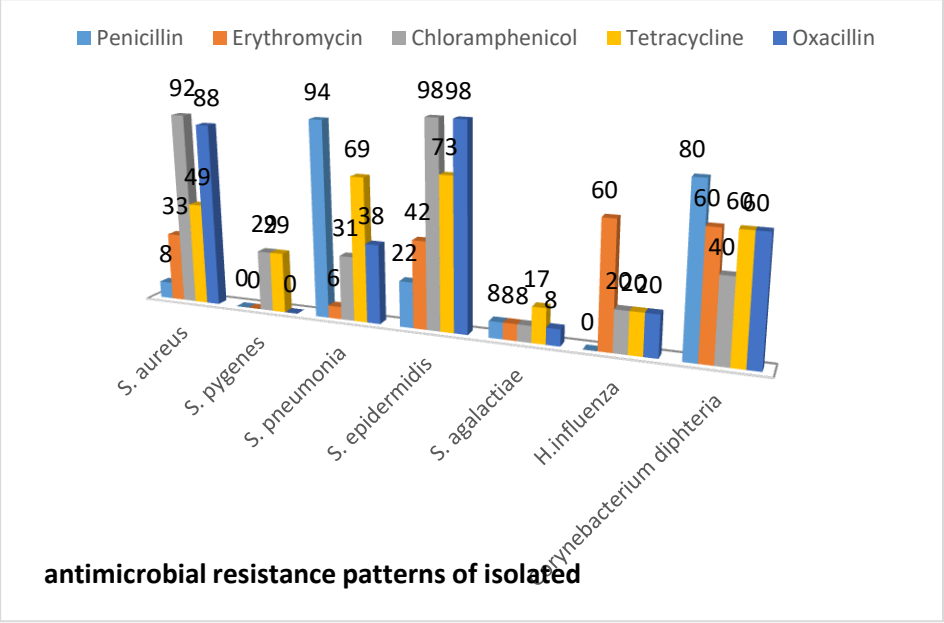


figure 5. The antimicrobial resistance patterns of isolated bacteria

Discussion

The percentage of bacteria which was isolated from the samples were 23.5% for *S.epidermids* ,21.3% for *S.aureus*,5.9% for *S.pneumonia*,5.1% for *S.agalactiae*,1.5% for *C. diphtheriae*, 0.7% for *S.pyogenes*, .While,21.3% were having more than one type of bacteria and 20.6% were not infected by any of those types of bacteria.

S.aureus showed more sensitivity to tetracycline 92% followed by Penicillin 51%.

S.epidermids showed more sensitivity to the penicillin 78% . antibiotics like chloramphenicol and oxacillin showed more resistance 98%, followed by tetracycline 73% and erythromycin 42%.. *S.pneumonia* showed the highest resistance to the pecicillin which were 94% , followed by tetracycline 69%, and showed more sensitivity to chloramphenicol with 69%.

S.agalactiea showed high sensitivity to oxacillin (92%), followed by penicillin and chloramphenicol with percentage of 84% each. *S.agalactiea* showed no resistance to any of the antibiotics studied in the current study.

H. influenza isolates showed high resistance to erythromycin antibiotics, and therefore, the results of isolates showed high sensitivity to tetracyclin, oxacillin, and chloramphenicol respectively (80%, 80%, 60% each). The isolates showed highest sensitivity to penicillin.

Corynebacterium showed resistance to penicillin 80%, erythromycin 60%, and tetracycline 60%. While, showed high sensitivity to chloramphenicol, and oxacillin with percentage of 60% for each of the antibiotics.

The total bacterial isolates of S.pyogenes had high and intermediate sensitivity to all types of the antibiotics which were oxacillin 100%, penicillin 71%, erythromycin 57%. The results showed intermediate sensitivity to chloramphenicol and tetracycline with percentage of 71%.

Staphylococcus aureus was sensitive to penicillin 92%, followed by 51% to tetracycline. Streptococcus pyogens was sensitive to oxacillin by

100% followed by 71% to penicillin. Streptococcus pneumonia was sensitive to chloramphenicol 69% followed by 62% oxacillin. Staphylococcus epidermids was sensitive to penicillin by 78%. Streptococuus agalactie was sensitive to penicillin by 84% followed by 84% to chloramphenicol and 92% oxacillin. Haemophilus influenza was sensitive to 100% penicillin, followed by 80% to tetracycline and oxacilline. Corynebacterium dipheteria was sensitive to 60% chloramphenicol and oxacillin.

Staphylococcus aureus was resistance to chloramphenicol 92%, followed by 88% to oxacilline. Streptococcus pyogens showed no resistance to any antibiotics. Streptococcus pneumonia was resistance to penicilline 94% followed by 69% tetracycline. Staphylococcus epidermids was resistance to chloramphenicol and oxacilli by 98%. Streptococuus agalactie showed no resistance. Haemophilus influenza was resistance to Erythromycin by 60%. Corynebacterium dipheteria was resistance to only penicillin antibiotic by 80%.

Conclusion

the present study conclude that the best choice of treatment for tonsillitis that has been caused by *s.aureus* especially the resistant isolate is tetracycline in which the result shows that the isolated bacteria was sensitive to this antibiotic by 92%. Whereas, the penicillin had shown to be the best choice for treating infection caused by *s.epidermids*, in which this bacteria was sensitive to this antibiotic by 78%. In tonsillitis caused by *s.pneumonia* the preferably drug is oxacillin in which the bacteria was sensitive with 100%. *H. influenza* was sensitive to penicillin at rate of 100% so it would be the optimal

treatment. *Corynbacterium dipheteria* which was sensitive to chloramphenicol and oxacilline with sensitivity rate of 60% both, these two drugs would be the optimum choice for treating the infection.

The present study illustrated that the bacterial infection is more prevalent in the group of 7 years. It was observed that *S.epidermids* to be the most predominant bacteria followed by *S.aureus* and *S.pneumonia* responsible for tonsillitis infection. Presence of S.pyogens was observed in one of the patients among the hundred and thirty six patients subjected for the evaluation. The penicillin was found to be the effective drug to cure acute tonsillitis besides other antibiotics like Tetracycline, and Oxacillin.

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