THE EFFECT OF VINEGAR SOLUTION ON THE BACTERIA THAT CAUSE IMPETIGO

Anfal Shakir Motib

ABSTRACT

Out of forty six samples collected from impetigo patients, forty-two bacterial isolates were obtained, *Staphylococcus aureus* was constitute 24 isolates, *Streptococcus pyogenes* was 14 isolates and *Proteus mirabilis* was only 4 isolates. The sensitivity of these bacterial isolates were tested against 7 different antibiotics. It was shown that the highest sensitivity of these isolates were against Erythromycin and Mithicillin, were as both Ciprofloxacin and Piperacillin were the most active inhibitors of the tested bacteria. On the other hand, the activity of vinegar solution of different concentration were tested against the different bacterial species isolated from impetigo cases. The results showed that the majority of bacterial isolates were sensitive to concentration between 2-32 mg\ml. The MIC and MBC of vinegar solutions toward the three bacterial species were as follows: for *Proteus mirabilis* were 0.5-1.0 mg\ml, for *Streptococcus pyogenes* were 0.5-0.75 mg\ml and for *Staphylococcus aureus* were 0.15-0.25 mg\ml respectively.

Key words:- Impetigo, Bacteria, Antibiotics, Vinegar.
THE EFFECT OF VINEGAR SOLUTION ON
THE BACTERIA THAT CAUSE IMPETIGO.

Anfal Shakir Motib

INTRODUCTION

Impetigo is a contagious superficial pyogenic infection of the skin. It is of two main clinical forms; non bullous impetigo (impetigo contagiosa of Tilburg fox) and bullous impetigo (1).

Bacteriology:- Non-bullous impetigo may be caused by both Staphylococcus aureus and Streptococcus pyogens but there has been controversy as to the relative importance of the two genera, this may be partly depend on geographical variations. The streptococcal form being more prevalent in warmer climits (2,3). Staphylococcus aureus may be secondary invader in streptococcal impetigo and in some cases, it may be the predominant or the the only isolate, and the evidence for Streptococcal involvement may be rest on serology. Red lake Indian reservation in northern Minnesota detected both Staphylococcus aureus and streptococci, each alone in a sizeable minority, but both together in 58% of cultures, he concluded that in many of the mixed culture cases, the disease was primarily streptococcal with Staphylococcus aureus as secondary colonizer (4). Recent European publications suggest that the Staphylococci may be the predominant infectious agent in most cases (5).

In streptococcal impetigo, lance field group A is by far the commonest, but there are occasional infections with group G and C organisms (4). Bullous impetigo is accepted as a Staphylococcal disease ( predominantly phage group II ) which produce epidermolytic toxin locally, and induce epidermal splitting and blister formation in bullous impetigo, while in generalized Staphylococcal scalded skin syndrome , the toxin is disseminated haematogenously (2,5).

Clinical features:- non bullous impetigo occurs more commonly in preschool age children, the initial lesion is a very thin-walled vesicle or pustule on an erythematous base, that ruptures quickly and evolving to yellowish-brown (honey-camp) crusted plaque, which show gradual irregular peripheral extension, without central healing up to (2 cm) and multiple lesions were coalesce, usually there are no constitutional symptoms excepted in sever cases, but regional lymphadenopathy may be present in up to 90% of patients with sever prolonged untreated
infection. The face and the limbs are the sites more commonly affected, but lesions may occur anywhere on the body (1,5,6). Bullous impetigo occurs commonly in newborn and in older infants, and is characterized by rapid progression of vesicles to flaccid bullae, which are less rapidly ruptured and become much larger (up to 1-2 cm in diameter) and may persist for 2-3 days. Although the face is often affected, the lesions may occur anywhere on the skin, and the buccal mucous membrane may also be involved, but commonly, rather few lesions are present and regional lymphadenitis are rare (5,6).

**Diagnosis:** is made by clinical criteria and confirmed by gram stain and culture of exudates from lesion (6).

**Treatment:** in mild and localized infection, a topical antibiotic alone may be sufficient (e.g. imipenem, fucidic acid, bacitracin) for both *staphylococcus* and *streptococcus* impetigo. If the infection is widespread or severe or accompanied by lymphadenopathy or there is a reason to suspect a nephritogenic streptococcus, an oral antibiotic (flucloxacillin or erythromycin is indicated), azithromycin, cephalexin, cefprozol, and clindamycin) are alternative therapies (7,8). Black tea (as topical ointment) also give good result in treatment (9).

Vinegar has been used in one form or another for over 10,000 years. It is used for many purposes and throughout the ages has served as a preservative, condiment, beauty aid, cleaning agent, and in medicine. The word vinegar comes from the Latin word venom meaning wine and Acer meaning sour. These two words eventually became one word and is now as vinegar. In 5000 B.C, the Babylonians fermented the fruit of date palms and created date vinegar. The roman made vinegar from grapes, figs, dates and rye. The armies of Julius Caesar would drink vinegar and water for its antisepctic properties (10). Many ancient cultures used vinegar and valued it for its medical benefits. It was used for disinfecting wounds and for insect bites and snake bites. Vinegar compresses were useful for healing bruises (11). The vinegar is a sour and astringent liquid consisting mainly from acetic acid, resulting from fermentation of an alcoholic beverage mainly whites and red wines. This product is cheap, easily found in the markets, and seems to have antimicrobial potential (12). The aim of this study is to test the effect of vinegar solution on the bacteria that cause impetigo.

**MATERIAL AND METHODS**

**Sample collection:** Forty six patients were examined attending the out clinic of Baquba teaching hospital for the period, 30th of April to the 31st of July 2010. There were 28 males and 18 females, their age of 2-6 years. They complained of rash on the skin, which was diagnosed clinically as impetigo. They were interrogated regarding the age, sex, address, chief complain, previous and present history of any associated disease. Sterile cotton swabs were taken from the lesions, under full aseptic conditions.

**Bacterial species isolation and identification:** the samples were cultured on blood and MacConkeys agar for 24 hours at under aerobic condition for bacteriological studies, the isolation and diagnosis of types of bacteria was done according to the ideal methods (13, 14).
THE EFFECT OF VINEGAR SOLUTION ON
THE BACTERIA THAT CAUSE IMPETIGO.

Anfal Shakir Motib

Bacterial sensitivity test to antibiotics: The sensitivity of bacterial isolates were determined against 7 different antibiotics (cephalexin, cefotaxime, methicillin, erythromycin, gentamycin, piperacillin, ciprofloxacin) using the method of kerby and bauer, according to this method, bacterial suspension of $0.1 \times 10^6$ CFU concentration was distributed on the surface of Muller-Hinton agar media for all bacterial species except *Streptococcus pyogenes* use blood agar instead of Muller-Hinton agar, then the antibiotic disc were put on the surface of culture media by sterile forceps. the plates were incubated under aerobic condition at 37°C for 24 hours, then the results were read by measuring the inhibition zones in mm (15).

Vinegar preparation: Industrial vinegar solution prepared from local Iraqi date of has been used. Concentration of 5% acetic acid (50 mg/ml) stock solution was used and graduated concentration (32, 16, 8, 4, 2 mg/ml) were prepared according to (16).

Bacterial sensitivity to vinegar solution: The bacterial isolates against different antibiotics were chosen to test their sensitivity to vinegar by agar well diffusion method (17). The activity of different concentrations of vinegar solution were determined by measuring the inhibition zone. On the other hand the minimum inhibitory concentration and minimum bactericidal concentration (MIC,MBC) of the vinegar solution by agar dilution method were also determined (18) and the used dilutions were (0.15, 0.25, 0.5, 0.75, 1, 1.5, 2.5)mg/ml.

RESULTS

Table (1) - The percentage of the bacterial isolates resistant to different antibiotics.

<table>
<thead>
<tr>
<th>Proteus mirabilis</th>
<th>Strept.pyogenes</th>
<th>Staph.aureus</th>
<th>Antibiotics</th>
</tr>
</thead>
<tbody>
<tr>
<td>50%</td>
<td>71.4%</td>
<td>50%</td>
<td>Cephalexin</td>
</tr>
<tr>
<td>25%</td>
<td>42.9%</td>
<td>37.5%</td>
<td>Cefotaxime</td>
</tr>
<tr>
<td>50%</td>
<td>71.4%</td>
<td>70.8%</td>
<td>Methicillin</td>
</tr>
<tr>
<td>75%</td>
<td>78.6%</td>
<td>62.5%</td>
<td>Erythromycin</td>
</tr>
<tr>
<td>25%</td>
<td>42.9%</td>
<td>33.3%</td>
<td>Gentamycin</td>
</tr>
<tr>
<td>0</td>
<td>35.7%</td>
<td>41.7%</td>
<td>Piperacillin</td>
</tr>
<tr>
<td>0</td>
<td>35.7%</td>
<td>33.3%</td>
<td>ciprofloxacin</td>
</tr>
</tbody>
</table>
THE EFFECT OF VINEGAR SOLUTION ON THE BACTERIA THAT CAUSE IMPETIGO.

Anfal Shakir Motib

Table (2)- The effect of different concentration of vinegar solution on growth of different bacterial species in (mm).

<table>
<thead>
<tr>
<th>Bacteria Species</th>
<th>Concentration of vinegar solution in mg /ml</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>38.3</td>
<td>42.27</td>
</tr>
<tr>
<td><em>Streptococcus pyogenes</em></td>
<td>29.1</td>
<td>31.2</td>
</tr>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>15.1</td>
<td>18.23</td>
</tr>
<tr>
<td>Mean</td>
<td>27.51</td>
<td>30.56</td>
</tr>
</tbody>
</table>

L.S.D Concentration Bacteria Concentration x Bacteria

0.05 1.300 1.679 Non Significant

0.01 1.892 2.366 Non Significant

Table (3)- MIC and MBC of vinegar solution on different bacterial growth measured in (mg/ml)

<table>
<thead>
<tr>
<th>Bacteria</th>
<th>MIC</th>
<th>MBC</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Staphylococcus aureus</em></td>
<td>0.15</td>
<td>0.25</td>
</tr>
<tr>
<td><em>Streptococcus pyogenes</em></td>
<td>0.5</td>
<td>0.75</td>
</tr>
<tr>
<td><em>Proteus mirabilis</em></td>
<td>0.5</td>
<td>1</td>
</tr>
</tbody>
</table>
THE EFFECT OF VINEGAR SOLUTION ON 
THE BACTERIA THAT CAUSE IMPETIGO.

Anfal Shakir Motib

DISCUSSION

Table No (1) describe the sensitivity of bacterial isolates from impetigo patient. Forty-two bacterial isolates (24 isolates of Staphylococcus aureus, 14 isolate of Streptococcus pyogens and 4 of Proteus mirabilis) were tested against 7 antibiotics, by measuring the inhibition zone in mm (15). This table explain that the majority of bacterial isolates show resistant to more than one antibiotics. Staphylococcus aureus show resistant to ( cepahlexin, methicillin, erythromycin), the (50%, 70.8%, 62.5%), while Streptococcus pyogens show resistance by (71.4%, 71.4%, 78.6%) and Proteus mirabilis by (50%, 50%, 75%). On the other hand, the cefotaxime and gentamycin antibiotics show good activity toward Proteus mirabilis when the percentage of bacterial isolates resistant reach (25%, 25%) respectively and the percentage of resistant to cefotaxime antibiotic for Staphylococcus aureus and Streptococcus pyogens found to be (37.5%, 42.9%) respectively while the percentage of resistant to gentamycin antibiotic reach (33.3%, 42.9%) respectively. The ciprofloxacin, piperacillin antibiotics show good activity toward the bacterial isolates mentioned above when the resistant of Staphylococcus aureus to these antibiotics reach (33.3%, 41.7%) respectively and reach (35.7%, 35.7%) respectively for Streptococcus pyogens, while the Proteus mirabilis show no resistant to both antibiotics. The cause of high bacterial resistant to the used antibiotics was the widely used of these antibiotics (14), in addition, the development of the bacterial resistant due to change in the site of antibiotic activity and bacterial membrane permeability or may be enzymatic resistant (19,20). Three bacterial isolates were taken from each bacteria which show high resistant to antibiotics for testing their sensitivity to vinegar solution. All concentration of vinegar solution show effect on bacteria in comparison with distal water in different percentage, while the statistic analysis show no significant differences between the concentration of vinegar solution in their effect on growth of bacteria and in probability of 0.05 and 0.01. Table (2) show that Staphylococcus aureus was the highly sensitive to vinegar solution from other types of bacteria when the means of inhibition zones reach (38.3, 42.27, 45.23, 46.33, 47.3)mm for the concentrations (2, 4, 8, 16, 32) mg/ml respectively and the cause of this may be due to the vinegar solution contain high concentration of acetic acid (10), while the ratio of inhibition zones for Streptococcus pyogens was (29.1, 31.2, 33.3, 35.3, 38.4) mm respectively for the same concentration, on the other hand, the Proteus mirabilis was the highly resistant to vinegar solution when the means of inhibition zones reach (15.1, 18.23, 21.2, 24.3, 26.4) mm respectively for the same concentration.

However, many of studies refer that the antimicrobial effect of vinegar solution may be due to prop ionic acid, acetic acid, pectin (fibers), and important minerals (such as potassium, calcium, magnesium, sulphur, chlorine, phosphorus, iron, silicon and other trace minerals), vitamins which are bioflavonoid {vitamin p}, beta carotenes {precursors to vitamin A }, vitamin {C, E, B1, B2, and B6}(12).

The MIC and MBC of vinegar solution described in table (3) refer to the activity of vinegar solution on different bacteria, the MIC of Staphylococcus aureus reach 0.15 mg/ml while that of Streptococcus pyogens and Proteus mirabilis reach 0.5mg/ml and the MBC of
THE EFFECT OF VINEGAR SOLUTION ON THE BACTERIA THAT CAUSE IMPETIGO.

Anfal Shakir Motib

Staphylococcus aureus reach 0.25 mg/ml while that of Streptococcus pyogenes and Proteus mirabilis reach (0.75,1) mg/ml respectively, and so, the decrease in MIC and MBC of vinegar solution on different bacterial types refer to the activity of vinegar on bacteria that cause impetigo. This effect may be due to the contents of vinegar (organic acids and oxidizing compounds) that lead to denaturizing of outer cell wall of the bacteria that lead to death (21).

CONCLUSIONS

1. The Staphylococcus aures Bacteria is the main bacteria that cause impetigo.

2. The ciprofloxacin and piperacillin have the highest activity (from other antibiotics) on different bacteria that cause impetigo.

3. The Staphylococcus aures Bacteria was the most sensitive to the action of vinegar solution while the Proteus mirabilis was the least sensitive to it.

REFERENCES

THE EFFECT OF VINEGAR SOLUTION ON
THE BACTERIA THAT CAUSE IMPETIGO.

Anfal Shakir Motib


