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In VitroEvaluation of the Anti-Bacterial Activityof Honey on a Few Selected Bacterial Associatedwith Upper Respiratory Tract Infections

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Abstract:

Background: Bacterial resistance toantibiotics is increasing globally and of notable challenge to infection disease controllers therefore a search for alternative treatment.Honeyis a substance broadly usedno longer as food but a therapeytic agent because of it's anti-microbial properties. Objective: The present study is aimed to evaluate the in-vitro activity of crude and processed honey on few bacteria associated with upper respiratory tract infections. A total of 20 Bacteria isolate collected from the Medical Microbiology Unit of Jos University Teaching Hospital had been used for this study. The isolates comprise of *Klebsiella Pneumoniae* 8 (40.0%), *Streptococcus Pneumonia* 8 (40.0%) and *Staphylococcus Aureus* 4 (20.0%). The antibacterial activity of honey was tested by means of the agar well diffusion technique using specific concentrations of honey (40, 60, 80, and 100%) Outcome from Antimicrobial susceptibility testing showed that *Klebsiella Pneumoniae* isolates exhibited sensitivity at all concentrations of crude honeyand showed inhibition at 80 & 100 % for processed honeyfollowed by *Streptococcus Pneumonia* that recorded inhibition at 60, 80 and 100% for crude and 100% for processed honey. *Staphylococcus aureus* was the least susceptible as both crude and processed honey recorded activity only at 100% concentration. The overall result indicates that crude honey exhibited a higher antimicrobial activity on upper respiratory tract infection-causing isolates than the processed honey. The present study has demonstrated that honey has some activity on upper respiratory tract infection bacterial. Therefore honey can be used as an alternative antimicrobials for upper respiratory tractinfections.

Keywords: Antibacterial, process and crude honey, Upper Respiratory tract Isolates.

I. INTRODUCTION

Growingantimicrobial resistancespaticularly antibiotics is of world challenge to healthcare givers as they present treatment demanding situations as no new group of antibiotics are being produced.[6] The non-stoprise in bacteria resistance to most of the available antibiotics has brought about the search for traditional way of treating illnesses. Honey is a sweet liquid produced by Apis mellifera bees from the nectar or secretions of floral.The bees can also combine a few particular substances with the excretions from plant-sucking insects to form honey. [5]Honey has been recognised since ancient times as substance that cures ailments because of its therapeutic potential.[16]The properties that contribute to theantimicrobial effect of honey consists ofLow pH, high osmolarity, and enzymatic production of hydrogen peroxide[12]Hydrogen peroxide is the essential contributor to the antimicrobial activity of honey[19]Honey has been used for decades as a conventional remedy for symptoms associated with upper respiratory tract infection (URTI), despitethe fact that clear prooffor its effectiveness is unknown.[4]

Honey can be used as an alternative remedyfor symptoms of respiratory tract infections, in addition to gastrointestinal and cardiovascular illnesses, due to the antioxidant, anti-inflammatory, antiviral, and antibacterial effects [2]

Abuelgasim and co-workers—researchers from Oxford University Medical College, within the United Kingdom—reviewed existing literature to evaluate honey's efficacy in relieving symptoms of upper respiratory tract infections together withcough frequency and severity anddiscovered that honey was superior when compared to the usual care.[1] The non-toxicity of honey and its local availability confer a valuable gain to the use of honey as an alternative antimicrobial.[17]. Althrough the history of mankind Infectious illnesses are known to be treated with herbal remedies. Natural substances have persisted to play a primary role in health care mainly in developing countries. [29]A great number of the populace in developing countries is predicated on natural drug treatment for their number one fitness care[29]. Honey consistent with research has been stated to have an inhibitory effect on over 60 species of bacteria including gram-positive and gram-negative bacteria[19].

II. MATERIALS and METHOD

A. Source of Bacterial Isolate

The bacterial isolates were obtained from the Medical Microbiology Department unit of Jos University Teaching Hospital, Plateau State.

B. Source of Honey

Two types of honey used for this study were crude honey and processed honey. The crude honey was

purchased at a bee farm at Vom village while the processed honey was bought from Onigbinde stores all in Jos Plateau State.

C. Identification of Test Organisms

The isolates suspected to be *Klebsiella Pneumoniae*, *Streptococcus Pneumoniae,* and *Staphylococcus Aureus* collected from the Medical Microbiology Department unit of Jos University Teaching Hospital were aseptically subcultured onto a fresh Nutrient Agar plate and incubated at 37^{0C} for 18 to 24 hoursto obtain a pure colony. The following Biochemical Tests were used to identify the Bacterial isolates Gram staining, Catalase Test, Coagulase Test, Motility Test, Citrate Utilization Test, and Optochin disc sensitivity test.

D. Standardization of Inoculum

The inoculum was prepared by aseptically transferring the test organisms from a fresh culture plate into 5ml of 0.95% sterile saline. The suspension was shaken to achieve homogenous suspensions. The homogenous suspension was later adjusted to 0.5 McFarland's standard.[17].

E. Antimicrobial Sensitivity Testing

The antibacterial activities of crude and processed honey were tested usingthe agar well diffusion method [Baur, 1966]. A sterile cotton swab was used to swab the inoculum by streaking it onto a dried Mueller Hinton 100ML agar plate.The plates were allowed to dry and wells of 6 mm diameter were bored on the inoculated plates using a sterile cork borer.The base of each hole was filled with molten MH agar to seal the bottom of the plate.An automated micropipette was aseptically used to transfer l00ul of kinds ofhoneydiluted in sterile water at different concentrations of 40%, 60%, and 80% and net (100%) into labeled wells. The control well was filled with l00ul of Ciprofloxacin. The plates were incubated at 37°C for 24 hours.

F. Assessment of the Antimicrobial Potential of the Honey Samples

The susceptibility of the test organisms was indicated by a clear zone of inhibition around the wells to which the honey samples were placed and the respective zones of inhibition were measured, from the underside of the plate using the millimeter rule.

III. RESULTS

Table 1.shows the Distribution of Bacterial Isolate associated with Upper respiratory tract infections, it comprises*klebsiella Pneumoniae* 8(40%), *Streptococcus Pneumoniae* 8(40%), and *Staphylococcus Aureus*(20%)Table 2.Antibacterial activity of crude honey against some bacterial isolates associated with upper respiratory tract infection. According to the table,*Klebsiella pneumoniae* isolates had activity at all the dilutions of crude honey,(40, 60, 80, net) with zone diameter

inhibition of 0.63±2.50, 1.31±3.63, 3.62±6.53, and 13.38±7.98 followed by *Streptococcus pneumoniae* which shows zone inhibition of 0.63±2.50, 0.88±3.50, 9.06±8.99 at(60, 80 and 100) % concentration whereas for *Staphylococcus aureus* theinhibition onlyoccurred at net concentration 12.75+7.03 of crude honey.Table 3.indicatesThe antibacterial activity of processed honey against the bacterial isolates *Klebsiella pneumoniae* showed zone inhibitionof 1.88± 5.30 at 80% and 9.63±9.02 at net concentration, while *Streptococcus pneumoniae* and *Staphylococcus aureus* were inhibited at net concentration with zone inhibition diameter of 8.88±7.92 and 8.00±5.42 respectively.Table 4 shows the mean and standard deviation of zone diameter of crude and processed honey. Results indicate that crude honey exhibit a higher antibacterial activity against isolates compared to processed.

TABLE 1

DISTRIBUTION OF SOME BACTERIAL ISOLATE ASSOCIATED WITH THE UPPER RESPIRATORY TRACT INFECTIONS

	Bacterial isolates	***Frequency***	***Percentage***
I	Klebsiella pneumonia	8	40.0
II	Streptococcus pneumonia	8	40.0
III	Staphylococcus aureus	4	20.0
IV	Total	20	100.0

TABLE 2

ANTIBACTERIAL ACTIVITY OF CRUDE HONEY AGAINST THE BACTERIAL ISOLATES

Test organisms' mean and standard deviation of diameter of zones of inhibition (mm)						
		40g/dl	***60g/dl***	***80g/dl***	***Neat***	***CPX(10ug)***
I	Klebsiella pneumonia	0.63+2.50	1.31+3.63	3.62+6.53	13.38+7.98	18.50+16.36
II	Streptococcus pneumonia	0.00+0.00	0.63+2.50	0.88+3.50	9.06+8.99	30.31+5.06
III	Staphylococcus aureus	0.00+0.00	0.00+0.00	0.00+0.00	12.75+7.03	28.00+2.56

TABLE 3

ANTIBACTERIAL ACTIVITY OF PROCESSED HONEY ON SOME BACTERIAL ISOLATE ASSOCIATED WITH UPPER RESPIRATORY TRACTINFECTION

Test organism Means and Standard Deviation of the diameter of zones of inhibition (mm)						
		40g/dl	***60g/dl***	***80g/dl***	***Neat***	***CPX(10ug)***
I	Klebsiella Pneumonia	0.00±0.00	0.00±0.00	1.88±5.30	9.63±9.02	18.63±17.09
II	Streptococcus pneumonia	0.00±0.00	0.00±0.00	0.00±0.00	8.88±7.92	30.25±5.23
III	Staphylococcus aureus	0.00±0.00	0.00±0.00	0.00±0.00	8.00±5.42	28.25±2.63

IV. DISCUSSIONS

With the worldwide rise in bacterial resistance to the existing antibiotics, researchers havecontinued to develop an interest in traditional means of treating ailments.Honey has shown a promising alternative because of its antimicrobial properties.

Results from this study show that crude honey had more antibacterial efficacy than processed honey. The reason could be attributed that during the processing of honey some of its phytonutrients are being destroyed. The findings from the study indicate that*Klebsiella. Pneumoniae*and *Staphylococcus aureu*s were more susceptible to crude honey at 100% concentration than *Streptococcus Pneumoniae*. This conforms to a study done in India in 2010 [24]where a higher susceptibility was recorded in *Staphylococcus aureus* at 100% crude. Similarly, a study in Egypt in 2016 recordedsusceptibility with *S. aureus* at higher concentrations of crude honey.[25]

This report finding is in contrast with findings of a study donein 2012 where a higher sensitivity with *streptococcus pneumonia*was observed in both processed and crude honey than in*K. pneumonia*.[6]

This study also disagrees withthe study in Kano where*staphylococcus aureus* was the most susceptible to honey at lower dilution.[9]

The pattern of antibacterial activity of both crude and process honey according to this study on bacterial isolates tested can be summarized in this order of sensitivity *Klebsiella pneumonia*> *Streptococcus pneumonia*>*Staphylococcus aureus*

V. CONCLUSION

The present study has demonstrated that both crude and processed honey had antibacterial activity on some bacterial isolates associated with upper respiratory tract infections.

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