NASAL CARRIAGE RATE OF *STAPHYLOCOCCUS AUREUS* AMONG FOOD HANDLERS(VENDOR) IN UNIVERSITY OF MAIDUGURI

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ABSTRACT

Background: *Staphylococcus aureus* has long been recognized an important pathogen in human diseases. It remains a significant cause of mortality and morbidity in tropical countries, the ecological niches of the organism are the anterior nares of humans. this study therefore, assesses the nasal carriage of *Staphylococcus aureus* among food handlers and restaurants workers in university of Maiduguri, Borno state, Nigeria.

AIM: The aim of this study is to assess the carriage rate and antibiogram of *Staphylococcus aureus* among food handlers (vendors) within University of Maiduguri, Borno state.

Methodology: Nasal swabs specimen were collected, the swab sticks were immediately and carefully returned to their sterile containers and sealed with an adhesive tape. The collected specimens were then taken to the diagnostic laboratory for bacteriological analysis and examined using standard medical microbiology methods. Wet preparations were examined microscopically immediately after inoculation on mannitol salt agar and incubated at 37^0C for 24 hours.

Results: Out of 140 nasal swabs samples collected from the food handlers,12(16.8%) had *Staphylococcus aureus.*Males had the highest rate of 8(11.2%) against the females, 4(5.6%). Similarly, results also indicated that those within the age range of 21-30 had the highest rate, 6(8.4%)

Conclusion: A relatively lownasal carriageof *Staphylococcus aureus* was recorded, these findings however, should not discourage food handlers from using the protective measures like face shield or nose mask and increase personal hygiene to prevent further spread of the bacterium.

Keywords: food handlers, Nasal carriage, Restaurants, *Staphylococcus aureu.*

INTRODUCTION

Staphylococcus aureus has long been recognized an important pathogen in human diseases. It remains a significant cause of mortality and morbidity in tropical countries (Kluytmansm *et al.,*1997). The ecological niches of the organism are the anterior nares of humans (Steven *et al.,*2015). Available reports have also shown that about 30-50% of the human population carries the organism in their nasopharynx (Hennekinne *et al.,*
2010). and the nasal carriage of *Staphylococcus aureus* is implicated as a source of most community and hospital infections (Olonitola *et al.,*2007). Of interest however, is the evidence that food borne diseases can be spread by food handlers who are carriers of *Staphylococcus Aureus*. This had remained a common and persistent problem worldwide, Such food poisoning may also result from infections with enterotoxigenic strains of *Staphylococcus aureus* (Carmo *et al.,*2003). Indeed, restaurants have been classified as the second most important place for acquiring staphylococcal food poisoning which accounts for 14-20% of outbreaks involving contaminated foods in the USA and United Kingdom (Wieneke *et al.,* 1993).

Unfortunately, *Staphylococcus aureus* has a record of developing resistance quickly and successfully to antibiotics through a mechanism that involves the acquisition and transfer of antibiotic resistant plasmids (Tenover, F.C., and Moellering, R. C. J., 2007). as well as the possession of intrinsic resistance mechanisms (Kloos,1998). More so, the organism has been recognized as persistent nosocomial and community acquired pathogen with a capacity to evolve different mechanisms of resistance to most antimicrobial agents (Montefiore *et al.,*1989).In fact, the emergence of antibiotic resistant bacterial constitutes a major problem in antibiotic therapy due to antibiotics drug-abuse (Nwankwo and Nasiru, 2011).

Considering therefore, the rising concerns over food safety and the lack of research to ascertain the extent of *Staphylococcus aureus* colonization among food handlers, this study was mean to determine the nasal carriage rate, antibiotics sensitivity pattern, and potential risk factors associated with nasal carriage of *Staphylococcus aureus* amongst food handlers and restaurant workers in university of Maiduguri, Borno state, Nigerian.

MATERIALS AND METHOD

Study Area: The research was conducted on subjects inside the university of Maiduguri campus, Maiduguri is the capital of Borno state located in the North Eastern Nigeria and situated within latitude 10°N and 13°N and 10°N and 13°N and longitude 12° and 15°. longitude 12° and 15°., with a land mass of 70.898 square kilometers.

Study Population

The study population comprised of handler and restaurants workers of both sexes, the age of the subjects ranged from (15->40) who are working in the different restaurants in the University of Maiduguri campus and are not on antibiotic treatment or inhaler spray for at least one month prior to the day of sample collection.

Sample Collection and processing

A total of 140 nasal swab samples were collected using a sterile swab stick, This swabs were immediately and carefully returned to their sterile containers and sealed with an adhesive tape. The collected specimens were then taken to the medical microbiology laboratory and aseptically cultured on mannitol salt agar and then incubated at 37^0C for 24hours and immediately processed for microscopy, the culture plates were examined macroscopically to evaluate the appearance, size, color, and morphology of the colonies. The bacterial isolates were identified using standard bacteriological procedures, including Gram staining, microscopic examination and biochemical tests as described by Cheesebrough, M. (2004).

Wet preparation:

0.5ml of isotonic saline was aseptically added to the swab container and shaken together with the swab stick so that the organism will be released in to the saline, A drop of the suspension was place on a dried clean grease free microscopic slide, this was covered with coverslip and examined microscopically with low power objective (10x and 40x) for any possible parasite.(Cheesebrough, M. 2004).

Gram Staining: a smear was made on a dried clean grease free slide, this was air dried and heart fixed by passing the slide through a gentle flame three times. The slides were stained by Grams staining techniques and examine microscopically under oil immersion objective (100x).(Cheesebrough, M. 2004).

Catalase test

Procedure: A loop full of bacterial growth was taken from the nutrient agar and placed on a clean microscope slide. A drop of 3% H2O2 was added. Then an effervescence of oxygen gas within few seconds indicates a positive reaction. (Cheesebrough, M. 2004).

Coagulase test

Procedure: A drop of distilled water was placed on a clean glass slide. The water drop was emulsified with the test organism by using wire loop.

The test suspension was treated with a drop of rabbit plasma and mixed well. The slide was rocked gently for about 10 seconds. Macroscopic clumping observed in the plasma within 5-10 seconds was taken as positive.(Cheesebrough, M. 2004).

Data Analysis:

The data obtained were analyzed using Microsoft excel version 2007

RESULTS

Among the one hundred and forty (140) subjects recruited in to the study, 12(16%) were found to be harboring *Staphylococcus aureus,* males were 8(11.2%) while females were 4(5.6%). The study according to the age showed that between 21-30years had the highest infection rate of 6(8.4%) as shown on the table 4.1 and table 4.2 illustration and distribution. Antibiotic sensitivity results shows that Chloramphenicol, Levofloxacin, Erythromycin, and Ciprofloxacin had (100%) sensitivity pattern, while Pefloxacin had (75%) Ampiclox and Gentamycin had (25%) sensitivity pattern respectively, Amoxicillin, Norfloxacin and Rifampicin show no sensitivity (0%) as shown on Table 4.3

Table: 4:1 Age Distribution of *Staphylococcus aureus* in nasal swab of food vendors In University of Miaduguri

Sex	No. Examined	No. of Staph Isolates	Total(%)
Male	30	8	11%
Female	110	4	5%
Total	140	12	16%

Key: staph = *staphylococcu*s.

Table 4.2: Nasal Carriage Rate of *Staphylococcus aureus* in Relation to Sex

Age (year)	No Examined	No. of Staph Isolate	Total (%) X^2 p – value
15-20	24	0 (0)	0 (0)
21-30	60	6 (8.4)	6 (8.4)
31-40	40	2 (2.8)	2 (2.8)
40 Above	16	4 (5.6)	4 (5.6)
Total	140	12 (16.8)	12 (16.8)

Key: staph = *staphylococcu*s.

Table 4.3: Anti Susceptibility data of isolated *Staphylococcus aureus*

Antibiotics	Resistance (%)	Sensitivity (%)
Ciprofloxacin	0(0)	60(100)
Chloramphenicol	0(0)	60(100)
Erythromycin	0(0)	60(100)
Levofloxacin	0(0)	60(100)
Pefloxacin	15(25)	45(75)
Ampiclox	45(75)	15(25)
Gentamycin	45(75)	15(25)
Amoxicillin	60(100)	0(0)
Streptomycin	60(100)	0(0)
Norfloxacin	60 (100)	0 (0)

DISCUSSION

Nasal carriage is an important risk factor in outbreaks of food-borne diseases in which *Staphylococcus aureus* is implicated and it has remained one of the battled bacterial agents of infection in the African continent (Sivaraman et al., 2009). The overall prevalence of nasal carriage of *Staphylococcus aureus* amongst the restaurant workers and food handlers in our study recorded relatively low prevalence rate (16%) and this is almost in line with the findings ofBassyouni *et al.*(2012) that reported a carriage rate of 13.2% of *Staphylococcus aureus* among hospital workers in Sudan. Out of theTwelve (16%) restaurant workers in food outlets inside the University of Maiduguri who were found to be harboring *Staphylococcus aureus* in their nostrils, 4(5.6%) were females, while 8(11.2%) were males, Findings in this study were however very low compared with that of Loeto *et al.*(2007) who got a prevalence rate of 44% in Botswana. These variations could be due to the differences in the environmental and personnel hygiene between the study populations as observed by (Gashaw *et al.,*2018), (Bassyonni et al., 2012). Generally, there exists considerable variation of nasal carriage of *Staphylococcus aureus* prevalence within regions, countries and even inside each country. Global trends of *staphylococcal* nasal carriage demonstrated that nasal carriage is high in developed countries, as compared to underdeveloped and developing countries (Sivaraman et al., 2009) However, gender has become a predisposing factor for nasal carriage of *Staphylococcus aureus* as shown by the findings of this study; with males having a high prevalence of 11% compared to females with 5%. This is in line with report from a study that male gender has more risk factors for nasal carriage of Staphylococcus aureus, Bischoff*et al.,*2004).; though the present findings disagrees with those of (Khorvash *et al.,*2012), (Ghasemian*et al.,*2010) and Isibor, J. O. and Otabor, E. (2014), who found no significant difference between gender and rate of nasal carriage of the pathogen.

On the other hand, age has been identified in earlier studies as a factor influencing nasal colonization with *Staphylococcus aureus* (Bischoff *et al.,*2004). The prevalence of *Staphylococcus aureus* according to age in this study showed that the age range of 21-30 has the highest prevalence of 8% which is attributed to the maturity and sexually active age of the correspondents. Our findings in this study is not in line with the report by (El-Shenawy *et al.,*2013), Warren (2012), and Ibe and Wariso (2005),whose findings show that the prevalence of Staphylococcus aureus is higher in higher age group of above 70 years and teenage age group of 13-18 years.

Moreover, the antibiotic susceptibility profile of the isolates commonly used showed high susceptibility except Amoxicillin, Streptomycin and Norfloxacin, this is in line with the findings by (Erami*et al.,*2014). High sensitivity of Ciprofloxacin and Gentamycin among *Staphylococcus aureus* nasal carriage individuals.

CONCLUSION

A relatively low prevalence rate of *Staphylococcus aureus* nasal carriage was recorded among the investigated food handlers and restaurant workers. These findings resurge the imperative need for protective measures including increased public awareness programs, regular monitoring of food handlers for food borne pathogens and intensive training on primary health care and hygiene. The use of nose masks and face shield by food handlers and restaurant workers and periodical medical examination of correspondents could help to prevent spread of resistant strains of *Staphylococcus aureus*. Finally, this study should significantly implement effective and efficient quality control systems in areas of direct contact with food product as good manufacturing practices and standard operational procedures and future research addressing effective methods for sustained eradication of *staphylococcal* nasal carriage are clearly warranted to reduce the high risk of subsequent infection

RECOMMENDATION

From the findings in this study, it is recommended that:

1- The University authority should compel routine medical examinations which should include *staphylococcal* screening for food vendors operating on the campus and anyone found positive should be treated accordingly.

2- Proper awareness campaign should be made on maintenance of personal hygiene and cleanliness by food vendors and handlers as well as avoidance of drug misuse.

3- Ciprofloxacin, Erythromycin, and Chloramphenicol can be used for emphericals treatment of *staphylococcal* infections in Maiduguri metropolis.

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