

# Isolation and Identification of Bacteria Associated with the Palms of Primary School Pupils in Wukari, North East, Nigeria

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## Abstract

Bacterial load on the palms of one hundred and twenty (120) primary school pupils from four different schools (East Primary School, Unique Comprehensive School, Ebenezer Primary School and Fuwukari Staff School) in Wukari, North East, Nigeria was studied. The aim was to isolate and identify bacteria associated with palms of primary school pupils. Swabs were collected from both palms of all the pupils comprises of 60 males and females each of the study population. Standard bacteriological techniques were implored for the isolation, identification and antibiotic sensitivity test of the pathogens isolates. The results showed various isolates of *Staphylococcus aureus* 76 (35.7%), *Shigella dysenteriae* 34 (13.5%), *Staphylococcus epidermidis* 48 (14.9%), *Escherichia coli* 51 (17.4%), and *Enterococcus faecalis* 46 (14.8%). *Staphylococcus aureus* 76 (35.7%) and *Escherichia coli* 51 (17.4%) were the most frequently isolated pathogens. The isolation of *Shigella dysenteriae* 34 (13.5%) and *Enterococcus faecalis* 46 (14.8%) is of public health important as the isolation of this pathogens showed improper disposal of faecal wastes around the school surrounding or premises and also lack of proper clean up after visit to the rest rooms by the pupils. Subjecting these isolates to some selected antibiotics, the pathogens were susceptible to Ciprofloxacin, Gentamycin, Erythromycin, Chloramphenicol, Streptomycin, while resistant to Augmentin, Amoxicillin, and Ampiclox. This researched showed that the pupils hands were contaminated with pathogens as a result of poor personal hygiene and sanitation. To these end, school authorities are advised to keep soaps and water in accessible locations for hand washing, parents on their part should provide hand washing facilities for their children at home why Government should enact laws that will make provision of washing hand facilities in all public places mandatory for it citizens.

## Keywords

Isolation, Identification, Bacteria, Primary, School, Pupils, Wukari

## 1. Introduction

Hand hygiene is the act of cleaning one's hands for the purpose of removing soil, dirt and microorganisms. It is a general term that applies to hand washing, antiseptic hand washing, alcohol based hand rub or surgical hygiene/antiseptic [1-3]. Hand washing which is the easiest and commonest among these hand hygiene practices refers to washing hands with plain soap and running water and remains the most sensible and affordable strategy for hand

hygiene among the general population [2]. School children can be encouraged to wash their hands with water and a small amount of wood ash if soap is not available (although this should be avoided if it is likely to block the drainage system) and water points should be close to the classrooms as much as possible [4]. International agencies and governments because of the obvious benefits of hand hygiene in infectious disease reduction have been mounting interventions to improve the adoption of hand washing as a standard practice among community members. In Nigeria, hand washing was introduced as one of the strategies for hygiene promotion in

the Federal government of Nigeria/UNICEF/water sanitation and hygiene (WASH) programme in 2004, it was also re-launched on 20<sup>th</sup> May 2008 as one of the programmes designed to mark the international year of sanitation declared by the United Nations General Assembly [5]. These programmes were designed focusing more on mothers, children and adolescents. Targeting school children and young persons in the hand hygiene campaign will play a significant role in efforts to achieve the Millennium Development Goals (MDGs) connected to health improvements, education and the diminution of poverty and child mortality [4, 5]. This will obviously lead to early internalization of hand hygiene principles and practice from primary and secondary levels of education and ensure adherence to these practices all through life. Normally in a school setting these practices are internalized through the availability of sanitation facilities and hygiene education programmes which Aremu observed to be grossly inadequate in Nigerian primary and secondary schools [4]. The Nigerian demographic and health survey (NDHS) revealed that diarrhoea and cholera outbreaks which are diseases of poor hygiene are common occurrences in Nigerian schools [6]. Diseases in a school population is a major limiting factor in the educational progress of any child as it leads to absenteeism, poor classroom performance and early school dropout, and all these militates against the achievement of quality Universal Basic Education [7]. Even though hand washing is a common practice in the Nigerian society, the frequency and method of the practice might not have met internationally recommended standards. Many researchers have observed low compliance to standards of hand washing world over even with the availability of soap and water; worst still, even among medical professionals [8]. Most hand hygiene compliance studies have focused and documented this practice in hospital environment while very few studies had focused on schools [8]. In Nigeria, the need for such studies in primary schools is necessitated by the observation of NDHS outbreak of diseases and absence of enabling environment and facilities for the practice of hand hygiene [6]. There are five critical times during the day where washing hands with soap is important to reduce the faecal-oral transmission of disease; after defecation, after cleaning a child, before feeding a child, before eating and before preparing food or handling raw meat, fish or poultry [3, 6]. For children in particular, critical moments include after playing outside, or with toys and pets [8]. According to Centres for Disease Control and Prevention (CDC), hands should be washed with soap and clean running water (if available); Before, during and after preparing food, before eating food, before and after caring for someone who is sick, after using the toilet, after blowing the nose, coughing or sneezing, after changing diapers, cleaning or cleaning up a child who has used the toilet, after touching garbage or working in the garden and after touching animal or animal waste [9]. Contaminated palms play an extremely important role in faecal-oral transmission of diseases. In 1847, a Hungarian Obstetrician Dr Semmelweis Ignac showed the

correlation between infection and unclean hands and he demonstrated that washing hands could reduce transmission of puerperal fever, which was a dreaded disease with high mortality rate back then [10]. A number of studies have shown that the palms, especially those of elementary school pupils can harbour different types of pathogenic microorganisms which can survive for longer periods of time on the hands, having the potential to cause infection [11]. It is believed that hand washing could reduce transmission of infections such as diarrhoea and acute respiratory illnesses such as pneumonia which are the two major childhood killer diseases [12]. Despite the fact that it has been shown to be effective, hand washing with soap is not a common practice. Worldwide, there is a wide variation in the prevalence of hand washing behaviour and the use of soap for hand washing is not widespread [13]. This research therefore was carried out to isolate and identify the various bacteria present on the palms of primary school children from four different primary schools in Wukari town north east Nigeria.

## 2. Materials and Methods

### 2.1. Study Area and Population

This study was carried out in the Department of Microbiology, Federal University Wukari, Taraba State, Nigeria. Wukari metropolis is a large town which is the Headquarter of Wukari Local Government Area of Taraba State. Geographically, Wukari lies between latitude 7°55'42" North and longitude 9°47'59" East. It has an area of 4,308 km<sup>2</sup>. Wukari is home to Federal University Wukari, Kwararafa University and National open university. The major languages spoken are Jukun, Kutep, Tiv, Hausa and Fulani [14].

### 2.2. Sample Collection

One hundred and twenty (120) hand palms swabs were aseptically collected using sterile swab sticks from pupils of four (4) primary schools (East Primary School, Unique Comprehensive School, Ebenezer Primary School and Fuwukari Staff School) all in Wukari metropolis were immediately transported to Department of Microbiology, Federal University Wukari, laboratory for analysis.

### 2.3. Bacteriological Analysis

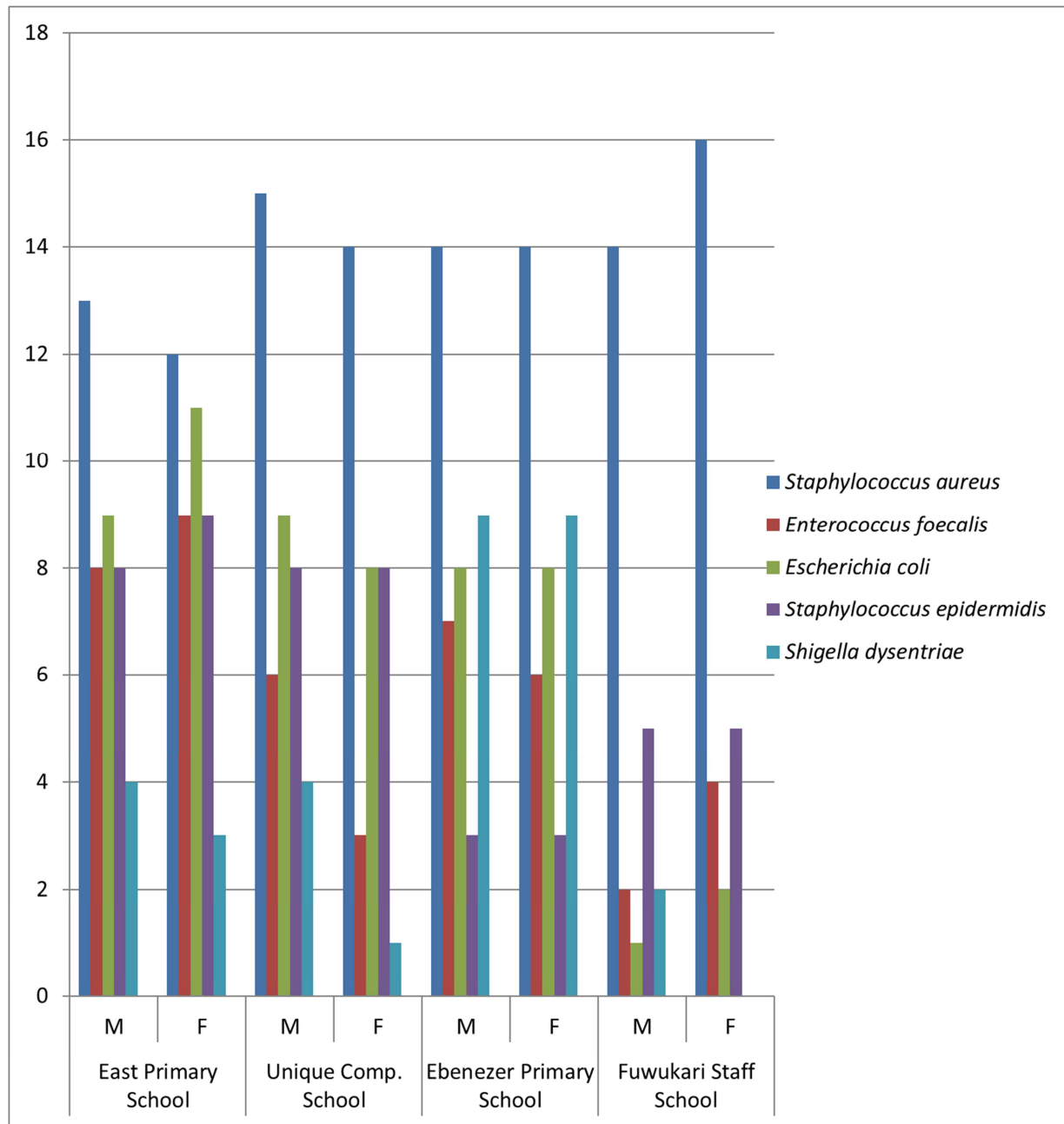
Collected samples were cultured on MacConkey agar and Mannitol salt agar using the streak plate method. The plates were incubated at 37°C for 24 hours. Discrete colonies were identified and characterized by morphological characteristics, Gram staining, biochemical tests and sugar fermentation analysis using standard microbiological methods [15].

## 3. Results

A total of 120 hand palms swabs samples collected from students from four (4) primary schools (East Primary School, Unique Comprehensive School, Ebenezer Primary School

and Fuwukari Staff School) in Wukari metropolis. Table 1 shows frequency of occurrence of bacterial pathogens isolated in the four schools. The percentage frequency of occurrence of bacterial pathogens isolated in the four schools

is shown in table 2. Table 3 shows antimicrobial susceptibility pattern of the isolates. Figure 1 shows the frequency distribution of bacteria isolated from the four schools.



**Figure 1.** Frequency distribution of various bacteria isolated from the four schools.

**Table 1.** Frequency of occurrence of bacterial pathogens isolated in the four schools.

Isolates	East Primary School		Unique Comprehensive School		Ebenezer Primary School		Fuwukari Staff School		Total pathogens
	M	F	M	F	M	F	M	F	
<i>Staphylococcus aureus</i>	10	8	10	8	10	7	11	12	76
<i>Enterococcus faecalis</i>	8	10	6	3	7	6	2	4	46
<i>Escherichia coli</i>	8	8	9	8	7	8	1	2	51
<i>Staphylococcus epidermidis</i>	8	10	8	6	3	3	5	5	48
<i>Shigella dysenteriae</i>	4	3	4	2	9	9	2	1	34
Total	38	39	37	27	36	33	21	24	255

**Table 2.** Percentage frequency of occurrence of bacterial pathogens isolated in the four schools.

Isolates	East Primary School (%)		Unique Comprehensive School (%)		Ebenezer Primary School (%)		Fuwukari Staff School (%)		Total (%)
	M	F	M	F	M	F	M	F	
<i>Staphylococcus aureus</i>	4.2	4.0	4.7	4.6	4.2	4.3	4.8	4.9	35.7
<i>Enterococcus faecalis</i>	2.4	2.7	2.2	1.0	2.3	2.0	0.6	1.6	14.8
<i>Escherichia coli</i>	2.9	3.2	2.9	2.5	2.7	2.3	0.3	0.6	17.4
<i>Staphylococcus epidermidis</i>	2.4	2.8	2.4	2.6	0.8	1.0	1.3	1.6	14.9
<i>Shigella dysenteriae</i>	1.8	1.8	1.9	0.2	3.4	3.3	0.9	0.2	13.5
Total	13.7	14.5	14.1	10.9	13.4	12.9	7.9	8.9	96.3

**Table 3.** Antimicrobial susceptibility pattern of the isolates.

Isolates	Chloramphenicol	Ciprofloxacin	Gentamycin	Perfloxacin
<i>Staphylococcus aureus</i>	S	S	S	S
<i>Enterococcus faecalis</i>	S	S	S	S
<i>Escherichia coli</i>	S	S	S	S
<i>Staphylococcus epidermidis</i>	S	S	S	S
<i>Shigella dysenteriae</i>	R	S	S	S

**Table 3.** Continued.

Isolates	Erythromycin	Amoxicillin	Augmentin	Ampiclox
<i>Staphylococcus aureus</i>	S	R	R	R
<i>Enterococcus faecalis</i>	R	R	S	R
<i>Escherichia coli</i>	S	R	S	R
<i>Staphylococcus epidermidis</i>	S	S	R	S
<i>Shigella dysenteriae</i>	R	S	S	R

**KEYS:**

S – Sensitive

R – Resistant

## 4. Discussion

The human hands harbour microorganisms both as part of a person's normal microbial flora as well as transient microbes acquired from the environment [16]. Some pathogenic organisms are spread by contaminated hands [1, 17]. Hygiene has a measurable impact on reducing the burden of infections in the developing world. In this research, the practice of hand washing either with water or with soap and water is very low as compared to what is obtainable in studies from other countries [2, 3]. The result of the study shows that well over 95% of all the pupils hands was contaminated with one bacterial pathogen or the other, and this is an indication of poor personal hygiene particularly hand hygiene, this agreed with the report of world health organisation in 2017. This has been attributed to lack of appropriate hand washing facilities or poor location of these facilities in primary schools in Wukari town. The prevalence of diarrhoea among school pupils for whom mainly unhygienic behaviour was recorded was higher when compare among pupils in mainly hygienic group [12]. This work also agreed with the report that less than 5% of pupils who has hygiene behaviour do not harbour these pathogenic organisms isolated [2, 3, 17]. The home and the school environments were of particular concern for the transmission of infections among pupils. Unfortunately, most schools in developing countries do not provide appropriate hand

washing facilities and where these facilities are available, they may be poorly located, have insufficient hand washing materials, be improperly used and most times be inaccessible to the pupils. Effective hand washing (including drying) is important in infection control. The correct hand washing is the single and most effective way to prevent the spread of communicable diseases. Good hand washing techniques is easy to learn and can significantly reduce the spread of infectious diseases among both children and adults. Hand washing is one among a range of hygiene promotion interventions that can interrupt the transmission of diarrhoea-causing pathogens [13, 17].

## 5. Conclusion

Hand washing practices in both public and private schools in Wukari metropolis are not observed particularly in public schools. Pupils are often targeted for hygiene behaviour as it is felt that habits that develop at their impressionable age would continue into their adulthood. However, in the absence of infrastructure for hand washing, inculcation of this habit would be nearly impossible. To this end, schools should promote hand hygiene practices in pupils by keeping soaps in toilets for hand washing. Teachers need resources and training in proper hand washing methodology to teach and able to supervise pupils if they are to be agents of change. Parents also be able to inculcates basic personal hygienic

standard in their children by providing facilities for hand washing at home.

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