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Assessment of ultrasound equipment as a possible source of nosocomial infection in Lagos state hospitals and radio-diagnostic centres

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ABSTRACT

Aim: To assess the role of ultrasound equipment as a possible source of nosocomial infection in Lagos metropolis, Nigeria.
Methods: Microbiological cultures were carried out on samples obtained from ultrasound probes, gel and couch before and after scanning period. Cultures were incubated in a culture plate (Chocolate and MacConkey agar) for 48 h at a temperature of 37° in order to grow microorganism, after which the culture plate was examined microscopically against a bright light in order to identify the isolated organisms based on their colonial characteristics.
Results: Transabdominal ultrasound probes, transvaginal probe, ultrasound couch and ultrasound gel all were contaminated with microorganisms. *Staphylococcus aureus* was the most frequent and most common organisms found (33.8%). Other organisms such as *Staphylococcus epidermidis* (15.4%), *Candida albicans* (6.2%), aerobic spore formers (26.2%), *Klebsiella pneumonia* (6.2%), *Pseudomonas aeruginosa* (3.1%), among others were also identified.
Conclusion: The ultrasound equipment posed a significant risk for infection transmission. Patients who underwent ultrasonography within the period of the study had significant chances of being infected with *Staphylococcus aureus*, *S. epidermidis* and Aerobic spore formers.

Introduction

Nosocomial infections are terms often used interchangeably with hospital acquired infection. A nosocomial infection is an infection a patient contracts during hospitalization which was neither present nor incubating at the time of his/her admission. It is also referred to as an infection that first appears between 48 and 72 h after a patient is admitted to a hospital or a health care facility.[1]

Nosocomial infections have long been recognized as a major public health problem globally[2] and are reported to be rising especially in resource-poor countries of the sub-Sahara Africa, and are important contributors to morbidity and mortality.[3] It is believed that they will become even more important as a public health problem with increasing economic and human impact because of increasing population, crowding of people and as the number of people with impaired immunity due to their age, illness and treatments increase. Furthermore, it has been suggested that the emergence of new microorganisms and increasing bacterial resistance to antibiotics will make nosocomial infections even more serious public health problems.[4] And quite unfortunately, little progress has been made, according to the World Health Organization (WHO), in addressing the basic problems responsible for the rapid increase in the incidence of nosocomial infections during the past 10–20 years. In 2010, for instance, the World Health Organization (WHO) reported that >50% of patients become infected during hospitalization.[5]

Nosocomial infections are reported to be more prevalent in resource-poor countries in Sub-Sahara Africa where preventable disease such as diarrhea, sexually infections and HIV/AIDS are endemic.[6] Moreover, it has been suggested that at least 80% of patients in developing countries acquires nosocomial infections and reasons given for the reported rise in the incidence of nosocomial infection include drug resistance, lifestyle changes and increased use of invasive procedures.[4]

In this era of evidence-based medical practice, many an ultrasound center is a beehive of activity daily as more patients are

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currently being referred for different ultrasound investigations by clinicians who require accurate diagnosis as basis for treatment of diseases. The ultrasound section of the radiology department therefore, understandably plays host to a large number of patients some of who come to the ultrasound center with open wounds, draining sores and drainage tubes as well as life support machines. And more often than not, the ultrasound gel and probe must make contact with patient's skin during sonographic examination. It has been reported that transmission of most infections can be prevented with readily available, relatively inexpensive aseptic strategies such as cleaning of ultrasound probe and couch with alcohol-based sanitizers.[7] This appears not to be the case in the metropolitan Lagos as most practitioners only wipe their probe with either a dry paper towel or napkin after use. It is also not uncommon to observe some sonographers who do not even ensure that the probe is thoroughly wiped clean before another patient is brought in. Such 'unsafe use of medical equipment' could make the ultrasound equipment, probe and gel likely veritable sources of nosocomial infection.[7] In fact, a note of warning had been sounded that 'with increasing use of ultrasound in medical diagnosis, there is the potential for transmission of nosocomial infection via the ultrasound probe, ultrasound couch and also the coupling gel' [8].

In several studies, different medical equipment and accessories have been implicated as harboring pathogens[9–12] and as such, may be involved in transmission of infections. It is therefore necessary to ascertain the role of ultrasound equipment as a possible source of nosocomial infection in Lagos State Nigeria.

Materials and methods

In the longitudinal study, convenience sampling method was used to select 3 ultrasound centers in Lagos metropolis. The ultrasound centers are located in Idi-araba, Fagba-Iju and Ebute-Meta suburbs respectively.

Data collection

A pathologist and a laboratory scientist with 15 and 10 years' experience respectively were recruited to help in data collection and in the reading of culture. A total of 36 swab samples were aseptically collected using sterile swab sticks from ultrasound probes, couches and coupling gel in the 3 ultrasound centers. Swabs were collected aseptically from the surface of ultrasound probes and couches before and after scanning periods. Swabs were taken immediately after scanning a patient and in the middle of the scanning period. The swabs were appropriately labeled and were taken to the laboratory immediately for culture on MacConkey and chocolate agar for isolation of pathogens. Fig. 1 shows the ultrasound machine from where samples were collected.

Preparation of cultural media

All culture (MacConkey and chocolate agar) were prepared according to the manufacturer's instructions.[13]

MacConkey agar preparation and inoculation

MacConkey agar is differential agar: 50 g of MacConkey agar (powder) was added to 1 L of deionized water and allowed to soak for 10 min. The Agar and deionized water were swirled to obtain a good mix and the mixture was thereafter sterilized by autoclaving for 15 min at 121 °C. The media was poured into petri-dishes after allowing it to cool to 47 °C. The culture plate was covered and allowed to set before inoculation of samples.

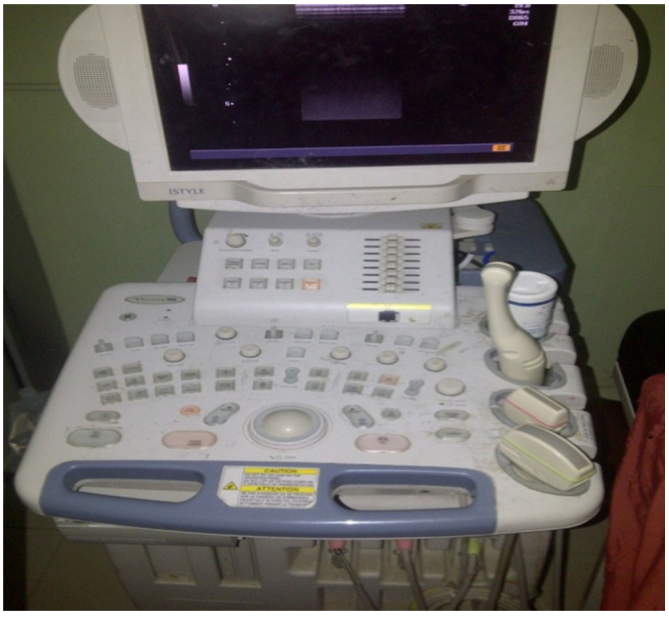

Figure 1. It shows a Doppler Ultrasound machine consisting of all relevant probes.

Chocolate agar preparation and inoculation

Chocolate agar is both an enriched and differential agar: 20 g of chocolate agar (powder) was added to 1 L of deionized water and allowed to soak for 10 min. The Agar and deionized water were swirled to obtain a good mix and the mixture was as well sterilized by autoclaving for 15 min at 121 °C. The media was poured into petri-dishes after allowing it to cool to 47 °C. The culture plate was then covered and allowed to set before inoculation of samples.

Inoculation, incubation and culture reading

The swab samples were cultured aseptically on a highly nutritious non-selective media (chocolate and MacConkey agar) designed to support the growth of most commonly encountered bacteria and fungi. Cultures were then incubated in their culture plates at a temperature of 37 °C for 48 h[14] in order to grow microorganism after which the culture plate was examined macroscopically against a bright light in order to grow microorganism. The culture plate was also examined macroscopically against a bright light in order to identify the isolated organisms based on their colonial characteristics

Figure 2. It shows the incubator used for this process.