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A SURVEY OF HOSPITAL ACQUIRED INFECTIONS IN OBAFEMI AWOLOWO UNIVERSITY TEACHING HOSPITAL, ILE-IFE

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A well-structured infection control programme plays a vital role in reducing mortality, morbidity and cost resulting from nosocomial infections in hospitalized patients. However infection-control activities in developing countries is severely constrained by lack of infection control infrastructure and lack of strong commitment by hospital clinicians and administrators as well as the level of socio-political and economic development prevalent in the developing world. The Infection Control Program (ICP) of Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) was established in 1995. An analysis of data of a hospital wide surveillance obtained between January 1995 and December 1999 is hereby presented, highlighting our experience with the pattern of nosocomial infection seen in this hospital. From January 1995 to December 1999, a total of 19,471 patients were discharged during this period. Of this, 515 cases of infection were recorded while on admission, giving an annual prevalence rate of 2.7% for nosocomial infection per year. (X^2 = 47.34, df = 4, p = 0.000). The highest infection rate was recorded from the orthopaedic ward (12.8%), followed by the intensive care unit (ICU)(8.4%) while the neonatal ward (NNW) and the paediatric ward (PW) recorded relatively low figures (0.5%) and (0.4%) respectively. Gram-negative rods (GNR) 491(78.8%) were commonly encountered as pathogens implicated in hospital-acquired infection (HAI) followed by *Staphylococcus aureus* and "other" organisms 17(2.7%). Current methods are inadequate because phenotypic typing alone has limited discriminatory power. DNA typing method is now the 'gold' standard for epidemiological and routine investigation of HAI.

INTRODUCTION

A safe and appropriate health care delivery should be an important pre-occupation in hospitals. One way of achieving this is the establishment of Infection Control Committees (ICC), which has the primary task to investigate and design measures to control all forms

of Hospital Acquired Infection (HAI), thereby ensuring that nosocomial infections are within reasonable control. However, it is also true that the effectiveness of infection prevention and control depends largely on the level of sophistication of health care services and the prevalence of diseases (1).

Well-structured infection control has a vital role in reducing mortality, morbidity and cost resulting from nosocomial infections in hospitalized patients (2, 3). The United States Study on the Efficacy of Nosocomial Infection Control (SENIC) showed that a properly conducted program of surveillance and control could prevent 32% or nearly one third of cases (1,4). Hence the incidence of HAI and the problem of resistant organisms are low in developed countries with well established infection control programs (1, 3). Whereas report from the developing countries south of the Sahara have put the nosocomial infection rate to vary from 3-15% (2,5), in Latin America, infection rate range from 10-26% with increased mortality and morbidity and a consequent economic burden (2,6,7).

Moreover, infection control activities in developing countries are severely constrained by lack of infection control infrastructures and a strong commitment by hospital clinicians and administrators (7,8), as well as the level of socio-political and economic development prevalent in the developing world (9). The Infection Control Program (ICP) of Obafemi Awolowo University Teaching Hospital Complex (OAUTHC) was established in 1995 with an Infection Control Team (ICT) reporting to an Infection Control Committee (ICC). An analysis of data of a hospital wide surveillance obtained between January 1995 and December 1999 is hereby presented, highlighting our experience with the pattern of nosocomial infection seen in this hospital and the challenges ahead.

MATERIALS AND METHODS

A systematic program developed by the hospital but based on the Centres for Disease Control protocol and WHO (2,5,9,10) for active surveillance for the collection routine input data was adopted by the hospital at the onset of infection control activities in 1995 to date. The hospital has 2 Infection Control Nurses (ICN) based primar-

ily in the Medical Microbiology and Parasitology department. The ICN work closely with the Consultant Medical Microbiologist, who in turn reports the findings of the ICT to the ICC. The ICC is responsible for policy formulation and recommendation to the hospital. The hospital in Ile-Ife has a bed space of approximately 400.

The microscopy, culture and sensitivity result of all specimens received in the laboratory are scrutinized by the ICN before the commencement of routine visit to the wards. The CDC guidelines for determining the presence and classification of infection, determine which event is HAI (4,5). All specimens in the laboratory and bacterial agents associated with HAI were investigated by standard microbiological methods (12).

Primary data were collected with the aid of forms, designed for active surveillance. This contained essential identifying data like patient's name, age, sex, hospital identification number, ward or location within the hospital, service and date of admission. Others are date set of infection, the site of infection, and the organism(s) isolated from specimens and antimicrobial susceptibility pattern of isolates. Monthly summary constitutes secondary data and the following are considered essential: service unit, site of infection and causative agent(s). These are further analyzed at the end of every year to generate a third level of data for the overall frequency and distribution pattern of HAI in our hospital, which is the basis of the present report.

RESULTS

From January 1995 to December 1999, a total of 19,471 patients who were previously on admission for various ailment or disease conditions were discharged during this period. Of this, 515 cases of infection were recorded while on admission, giving a prevalence rate of 2.6% of infection per patient discharged per year (x^2 = 47.34 df=4, p=0.000). Table I shows a break down and the prevalence of HAI by year. The highest infection rate was recorded in 1996 (3.6%) and the lowest was 1991 (1.2%), while Table II shows the summary and trend of infection according to service unit. The highest infection rate was recorded from the orthopaedic ward (12.8%), fol-

lowed by the intensive care unit (8.4%) while the neonatal ward (NNW) and the paediatric ward (PW) recorded relatively lower figures (0.5% and 0.4%) respectively. The pattern of HAI by service area is summarized in Table III. When the frequency and type of infection were compared, wound infection from the surgical service units was highest with 260 (50.5%), next was urinary tract infection (UTI) 204 (39.6%) followed by bacteraemia 34 (6.6%). Respiratory infections and miscellaneous infections were 5 (1.0%) and 12 (2.3%) respectively. However, when the patterns of HAI between surgical and medical services were compared, Chi square showed a significant difference (X^2 = 46.4, df 4, $p<0.05$).

Table IV shows the frequency of pathogens and hospital associated infections. Gram-negative rods (GNR) 491(78%) were commonly encountered as pathogens implicated in HAI, followed by *S. aureus* 115(18.5%) and 'other' organisms 17(2.7%). The individual Gram negative rods implicated in HAI is shown in Table V. The highest recoverable pathogen was from the genus *Pseudomonas* 1693(4.4%), followed by *Klebsiella* 151(30.8%), *Proteus* 84(17.1%) and *Escherichia* 58(11.8%) successively while the least was *Citrobacter* 3(0.6%). Gram-negative pathogens that presented difficulty with identification were reported as 'coliform 26 (5.3%). Figure A is a histogram illustrating Gram- negative rods and HAI.

Table 1: INCIDENCE AND PATTERN OF NOSOCOMIAL INFECTION IN OAUTHC ILE IFE

YEAR	NUMBER OF DISCHARGE	NUMBER OF INFECTIONS N(%)
1995	4805	107(2.2%)
1996	3411	122(3.6%)
1997	4185	127(3.0%)
1998	3703	119(3.2%)
1999	3367	40(1.2%)
TOTAL	19471	515(2.6%)

X^2 = 47.34, df = 4, P = 0.000

Table 2: SUMMARY AND TREND OF INFECTION BY SERVICE

SERVICE	DISCHARGES	INFECTION
SURGICAL WARD	3670	150(4.1%)
ORTHOPAEDIC WARD	876	112(12.8%)
OBST & GYNAE	5531	138(2.5%)
MED. WARD	3961	68(1.7%)
PAED	3638	15(0.4%)
NNW	1498	7(0.5%)
ICU	297	25(8.4%)
TOTAL	19471	515(2.6%)

Table 3: PATTERN OF HAI SERVICE AREA 1995-1999

SERVICE	BACTEREMIA	WOUND INFECTION	UTI	RESPIRA-TORY INFECTION	OTHERS
SURGICAL WARD	7	77	54	3	9
ORTHO WARD	-	85	25	2	-
OBST WARD	1	72	65	-	-
MED. WARD	12	10	46	-	-
PAED WARD	9	2	4	-	-
NEONATAL	4	-	3	-	-
ICU	1	14	7	-	3
TOTAL	34	260	204	5	12
515(100%)	(6.6%)	(50.5%)	(39.6%)	(1.0%)	(2.3%)

$X^2 = 46.4$, df = 4, P = 0.000 (p<0.005)

* For the purpose of analysis "surgical ward", "orthopaedic ward" and "Gynaecology" were combined as surgical, Medical ward and Paediatric ward were combined as Medical and Neonatal and ICU were also combined.

** The columns "Respiratory infections" and "others" were not included in the analysis due to the small number of samples in these groups.

Table 4: HOSPITAL ASSOCIATED INFECTIONS BY SITE AND PATHOGEN 1995-1999

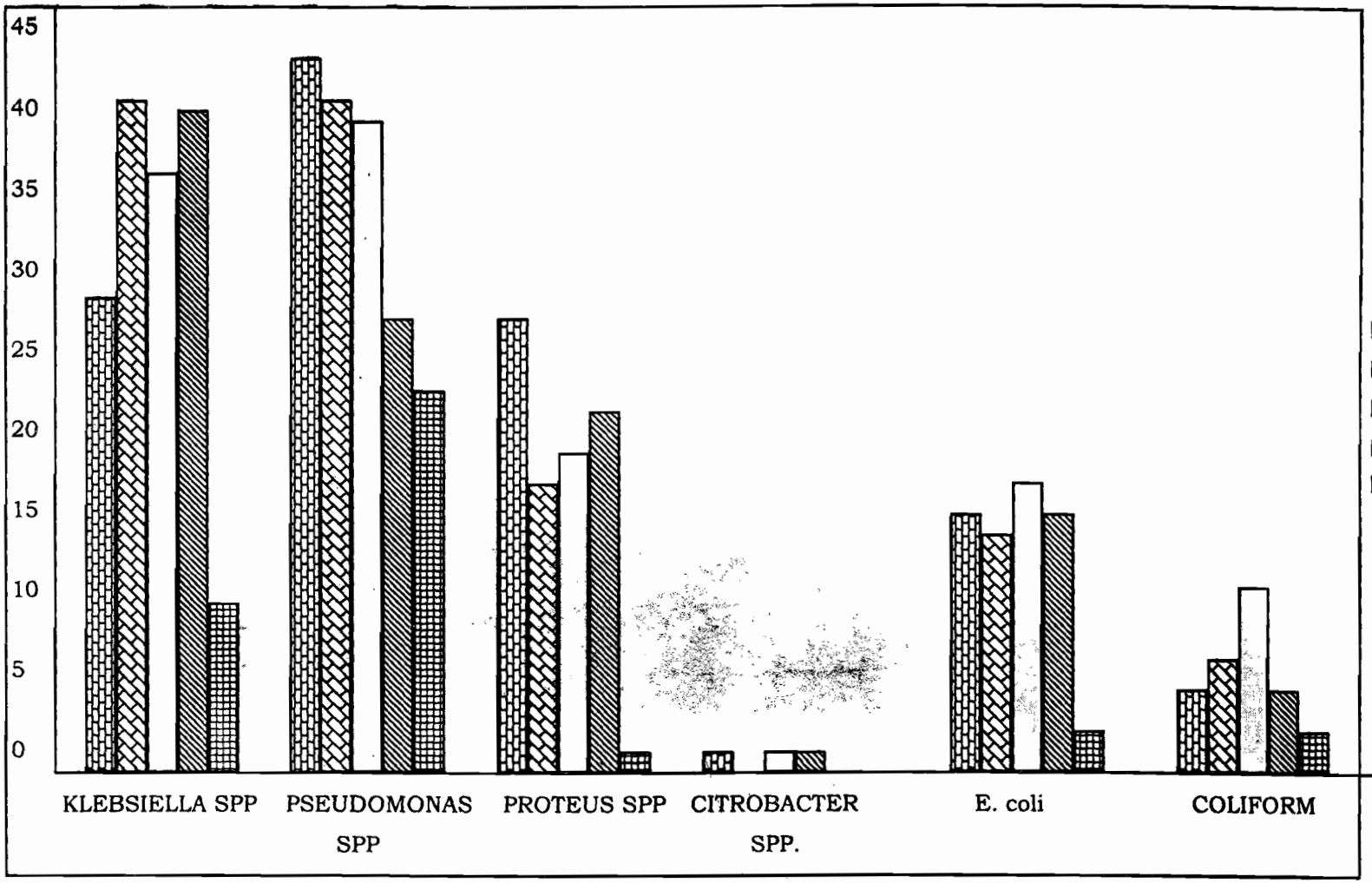
	GRAM NEGATIVE	S. aureus	*OTHERS
BACTEREMIA (n = 34)	17	16	2
WOUND INFECTION (n = 260)	286	83	14
UTI (n = 204)	177	16	-
RESPIRATORY (n = 5)	6	-	-
OTHERS (n = 5)	5	-	1
TOTAL 515	491	115	17

*Others
Coagulase negative *Staphylococcus* = 9
Streptcoccis faecalis = 8

Table 5: GRAM NEGATIVE RODS IMPLICATED IN HAI 1995-1999

ORGANISM	YEAR					
	1995	1996	1997	1998	1999	TOTAL
PSEUDOMONAS SPP.	42	40	39	27	21	169 (34.4%)
KLEBSIELLA SPP.	28	40	35	39	9	151 (30.8%)
PROTEUS SPP.	27	16	18	22	1	84 (17.1%)
CITROBACTER	1	-	1	1	-	3 (0.6%)
E. COLI	14	13	15	14	2	58(11.8%)
COLIFORM	4	6	10	4	2	26(5.3%)
	*	*	*	*	*	491(100%)

GRAM NEGATIVE RODS IMPLICATED IN HAI (1995-1999)



Pg. 114—45

DISCUSSION

The ultimate objective of establishing an ICP in any hospital is to translate surveillance efforts into infection prevention (1,5). In our experience, the overall average prevalence rate of HAI in this hospital is 2.6%. This figure is low when compared with 3.78% reported by Ogunsola *et al* (13) for Lagos University Teaching Hospital, and lower still for annual prevalence rate of 3-15% reported for hospitals in developing countries (5,6). Differences in matters of protocols and standard definition of cases of nosocomial infection may be responsible for differences in prevalence rate from one hospital to another which make a direct comparison difficult (4). This is why the CDC definition of nosocomial infection includes clinical and laboratory information and requires updating (2). However the investigation of HAI has been greatly aided by the development of DNA typing methods in the developed countries, tools that are currently not available to us at the moment.

Urinary tract infection (UTI) is the most common form of HAI accounting for between 30-45% (10,15), however, in our survey, UTI accounted for 39.6% of HAI after wound infection, which was 50.5%. Nearly all nosocomial UTI occurred in patients with recognized risk factors, such as urethral catheterization and other forms of instrumentation (13,15,16), this was also the case in our experience. The surgical service department recorded a high frequency of wound infection compared to the medical departments. This observation may reflect the extreme factors before, during and after operation of patients seen during this period. A prospective study done in this hospital on postoperative wound infection, reported an infection rate of 15.1% (17). However, this was restricted to general survey without orthopaedic and obstetrics and gynaecological cases taken into consideration, which are included in this survey. Our observation on the pattern of wound infections is consistent with report from other developing countries (16).

Bacteraemia as a form of HAI is most often secondary to urinary, surgical wound or lower respiratory tract infection, or to extra luminal cannular related sepsis (5). We observed that bacteraemia accounted

for 6.6% of total HAI seen in our hospital while a study from Trinidad and Tobago reported 8% (11). The underlying disease condition in the patients may have contributed to the observed level of bacteraemia in this survey.

Gram-negative rods were more implicated in HAI in this survey, more commonly, *Pseudomonas spp,* which is a recognized opportunistic pathogen in the hospital setting. The pattern of hospital associated infections by site and pathogen is similar to what has been reported by other studies (5,6,7,16). Fig. A shows modest achievement recorded on individual Gram-negative rods from 1995-1999 due to intervention method instituted like hand washing, increased disinfectant and soap rations to the wards and personal contacts to the clinical service departments.

Our survey shows that we need to improve on our infection control infrastructure and to encourage strict adherence to infection control practices such as hand washing techniques and improvement of facilities in the hospital environment (18). Finally, the effective prevention and control of HAI in the developing countries lies in the introduction and application of molecular epidemiology into surveillance activities. Current methods are inadequate because phenotypic typing alone has limited discriminatory power. DNA typing method is now the 'gold' standard for epidemiological and routine investigation of HAI (16,19).

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