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ANTIBIOTIC STEWARDSHIP AND ITS IMPACT ON ANTIBIOTIC USE AT THE CHILD HEALTH DIRECTORATE OF A TEACHING HOSPITAL IN GHANA

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ABSTRACT

Purpose: The study was intended to ascertain the existence of an antibiotic stewardship programme at the Child Health Directorate of Komfo Anokye Teaching Hospital (KATH) and assess the knowledge of health professionals about the importance of the antimicrobial stewardship programme. Again, it sort to assess the experience of participants with pharmacotherapy of infections and patient outcomes with generic and innovative brands of antibiotics. The third was to assess reporting on adverse reactions and storage conditions of the antibiotics.
Design/Methodology/ Approach: This was a cross-sectional study involving health professionals who participated in the provision of infectious disease management services. Eighty-eight (88) professionals were involved in the study, comprising nurses (n=51), medical doctors (n=21), pharmacists (n=8), biomedical scientists (n=5) and public health officers (n=3).
Findings: The majority (75 %, n=66) reported treatment failure with generic brands of antibiotics compared to innovator brands. Thirty-four percent of the participants reported adverse drug reactions (ADRs) on antibiotic therapy to superiors instead of filling out ADR forms.
Research Limitations: The study was done in one Directorate in the hospital and thus cannot be generalized to reflect the situation in all teaching hospitals in Ghana.
Practical implication: The evidence obtained highlighted the need for pragmatic antimicrobial stewardship (AMS) at the directorate to help optimize the management of childhood infections and minimize the emergence and spread of antibiotic resistance.
Originality/Value. This was an original project designed to generate evidence to inform interventions to promote the responsible use of antimicrobials in children.
Keywords*: Antibiotic. drug. reactions. resistance. stewardship.*

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INTRODUCTION

Antimicrobial stewardship refers to coordinated interventions designed to improve and measure the appropriate use of antimicrobials by promoting the selection of the optimal antimicrobial drug regimen, dose, duration of therapy, and route of administration. (IDSA, 2016).

Antibiotics have contributed immensely to the reduction in morbidity and mortality caused by infections. The improvement of socio-economic statutes of individuals through the treatment of infections with antibiotics cannot be overlooked. However, the challenges with the abuse and misuse of antibiotics cannot be under estimated (Reardon, 2015).

Antibiotic use is growing steadily worldwide, driven mainly by rising demand, easy accessibility, and poor regulation, especially in low- and middle-income countries. Global antibiotic consumption grew by 30% between 2000 and 2010 (Reardon,2015). This growth was driven mostly by countries such as South Africa and India, where antibiotics are widely available over the counter and sanitation in some areas is poor. In India, for instance, the number of *Klebsiella pneumonia* infections that are resistant to carbapenems doubled from 29% in 2008 to 57% in 2014. By contrast, fewer than 10% of *K. pneumoniae* infections in the United States and Europe are carbapenem-resistant. (Reardon, 2015).

A study in 2015 observed varied percentage coverage of antibiotic stewardship programmes (ASP) in the world. A total of about 58 % of countries in the world had implemented antibiotic stewardship programmes. The majority of countries with established antibiotic stewardship programmes were from Europe and the least from Africa. (Howard *et al.*, 2015).

In Africa, about 90 % of individuals seek health care outside the home. Out of this, 94 % take medicines and 36 % receive antibiotics. For persons who receive antibiotics, 31 % do not receive a prescription from a doctor and about 26 % obtain antibiotics from an informal dispenser. Antibiotics are widely and inappropriately used in Africa resulting in antibiotic resistance. This situation impinges on the quality of patient care through its associated morbidity, mortality and significant economic consequences (Kimang'a, 2012).

Studies in parts of Africa indicate that the practice of health professionals resisting changing current practice, financing, the behaviour of patients, capacity building, limited diagnosing and technological capabilities, the high price of some antibiotics, poor regulation of medicines, weak free trade policies among countries, counterfeit, substandard medicines, weak supply chain systems for antibiotics are among the key causes of antimicrobial resistance. In addition, there is poor data on antibiotic resistance, prescription practices, poor patient education on antibiotic use, promotional activities by companies on antibiotics, socioeconomic factors, cultural factors, increase in inappropriate use of antibiotics, especially in animals.(Gyansa-Lutterodt, 2013; Tadesse *et al.*, 2017; Bernabé *et al.*, 2017; Ayukekbong *et al.*, 2017; Matthew *et al*., 2020; Rolfe Jr *et al.*, 2021).

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Studies in Ghana indicate high levels of antimicrobial resistance, especially to penicillins, sulphonamides, gentamicin, ciprofloxacin and tetracyclines due to inappropriate use. Guidelines for antibiotic use established by the Ministry of Health in 2016 were yet to be implemented at the time of this study. (Lerbech *et al.*, 2014; Gyansa-Lutterodt, 2013).

The establishment of antibiotic stewardship programmes (ASP) has been acknowledged globally as a major step in ensuring the appropriate use of antibiotics. This programme is a more coordinated effort that seeks to promote appropriateness in the selection and use of antibiotics. (IDSA , 2016).

METHODOLOGY

Research design

This was a cross-sectional study conducted among health professionals in the Directorate of Child Health of the Komfo Anokye Teaching Hospital from March to October 2018.

Study site

The Komfo Anokye Teaching Hospital (KATH) is in Kumasi, the regional capital of the Ashanti region of Ghana. KATH is the second-largest teaching hospital in Ghana. It is endowed with experienced clinical and non-clinical staff and has well-equipped accident and emergency and eye centres. KATH has fourteen (14) clinical directorates some of which include child health, surgery, medicine, obstetrics and gynaecology, and family medicine directorate.

The Child Health Directorate currently has eleven sub-specialities. These include nephrology, infectious disease, gastroenterology, neonatology, cardiology, neurology, oncology, haematology emergency, intensive care and others. The number of sub-specialities in the Child Health Directorate outnumbers all other directorates in the hospital.

There are currently seventy-five (75) Doctors, Nine (9) Pharmacists, one hundred and seventy-five (175) Nurses, and four (4) Nutritionists in the Directorate. KATH is the major referral centre for the Ashanti, Bono, Ahafo, parts of Western, Eastern, Central, the Northern regions of Ghana as well as neighbouring Ivory Coast and Burkina Faso.

Study population and sampling technique

The study population was made up of healthcare professionals in the child health directorate.
Wards, consulting rooms, pharmacies, laboratories and other units in the directorate were visited with data collecting tools. Health professionals who were willing to take part in the study consented and issued structured questionnaires.

Inclusion and exclusion criteria

All health staff in the child health directorate were willing to take part in the study after reading and agreeing to the consent. Health staff not stationed in the study site and the child health directorate were excluded from the study.

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Ethical considerations

Approvals were obtained from the Komfo Anokye Teaching hospital and the Committee on Human Research, Publication and Ethics (CHRPE) at the Kwame Nkrumah University of Science and Technology.

Participants were made to read and sign the attached consent form before taking part in the study.

RESULTS AND DISCUSSION

Data Analysis

Data were captured using the Microsoft Office Access database. The data were analysed using STATA/MP 13.0 (StataCorp. 4905 Lakeway Drive Station, Texas 77845, USA). Descriptive statistics were conducted for both continuous and categorical variables. The data were presented as frequency tables, pie and bar charts.

Table 1: Demographics characteristics

Variable	Number of Health Professionals, N=88	Percentage (%)
Sex		
Male	25	28.4
Female	63	71.6
Profession		
Nurse	51	58.0
Medical Doctor	21	23.9
Pharmacist	8	9.1
Biomedical Scientist	5	5.7
Other	3	3.4
Have Postgraduate education		
Yes	19	21.6
No	69	78.4
Area of specialization		
None	51	58.0
Paediatrics	15	17.1
General nursing	7	8.0
Child Health	2	2.3
Midwifery	2	2.3
Other*	11	12.5

Other* includes: Health planning, haematology, Nephrology, Public health, Business administration, General, Human Resource Management, Microbiology, Pharmacy Assistant, Research and Strategic Management and consultancy.

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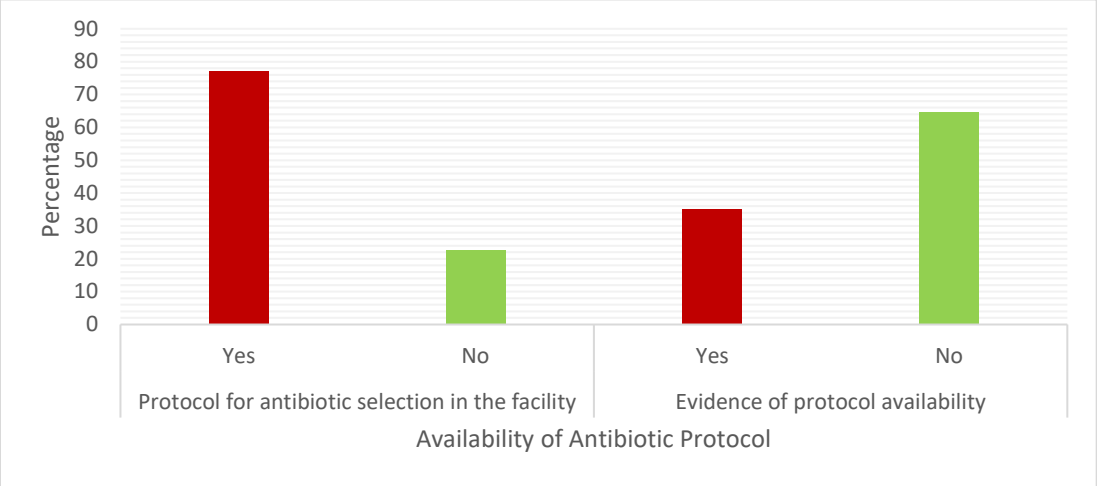

Figure 1: Presence of antibiotic protocol in the department

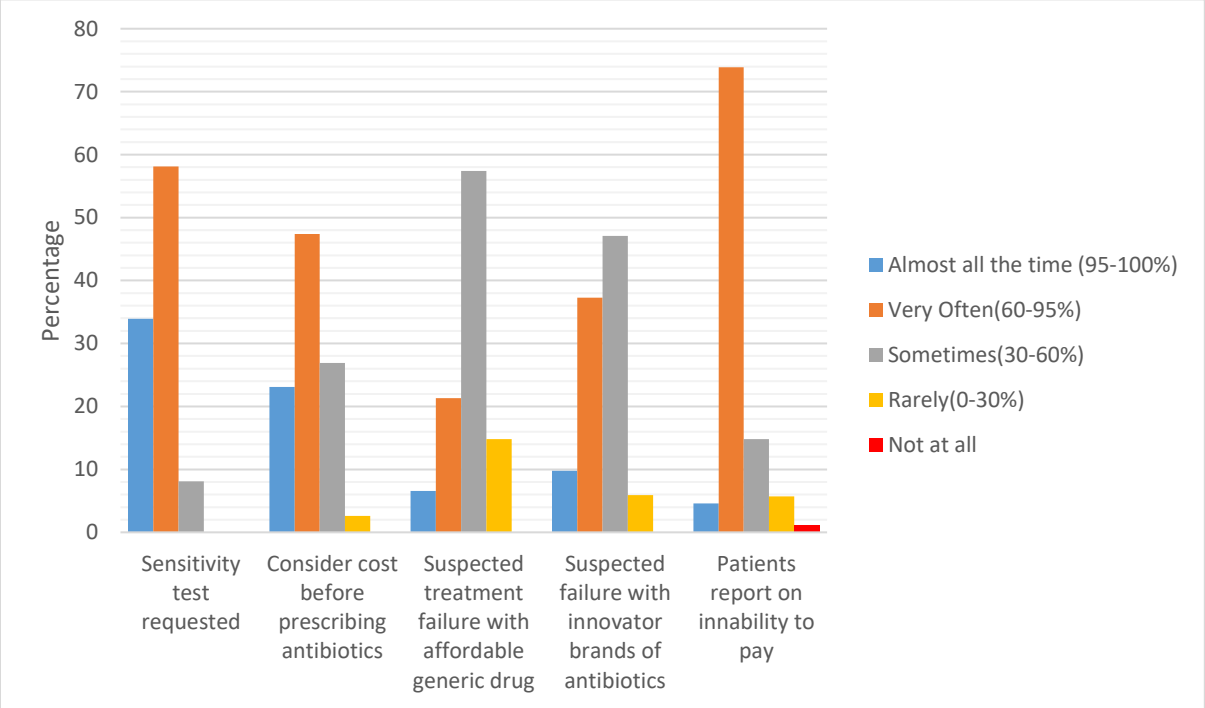

Figure 2: Considerations before prescribing antibiotic use and clinical outcomes with different brands of antibiotics

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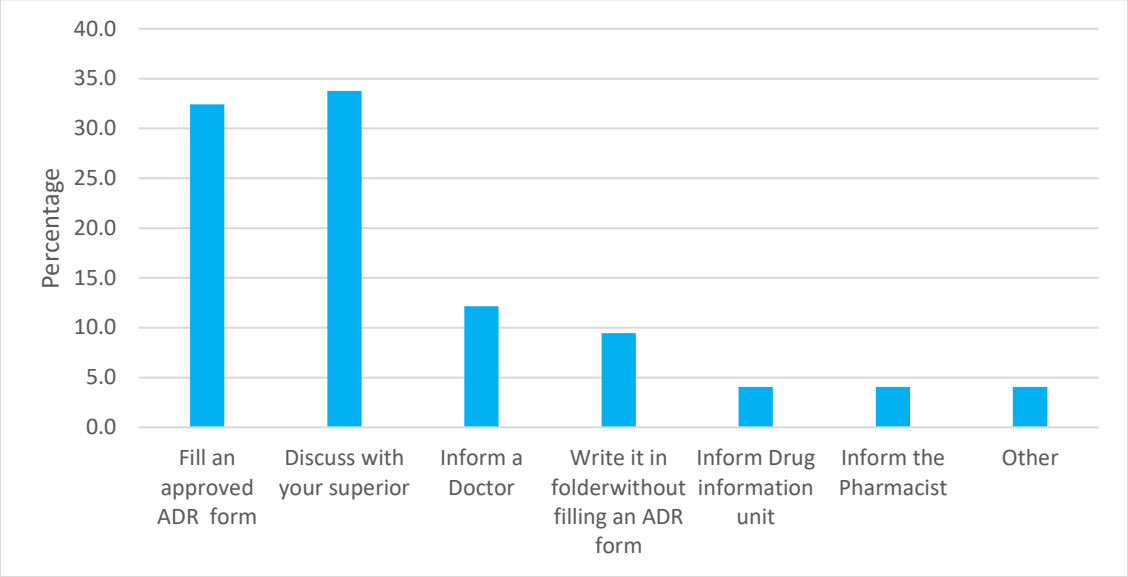

Figure 3: Procedure for reporting adverse drug reactions

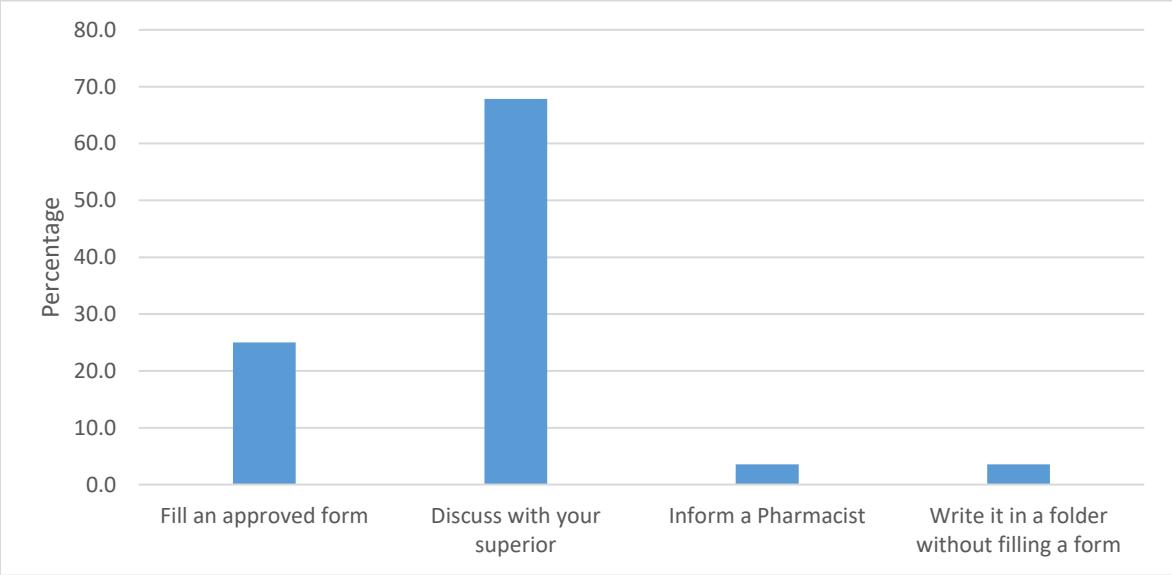

Figure 4: Procedure for reporting suspected drug resistance

ISSN: 2408-7920

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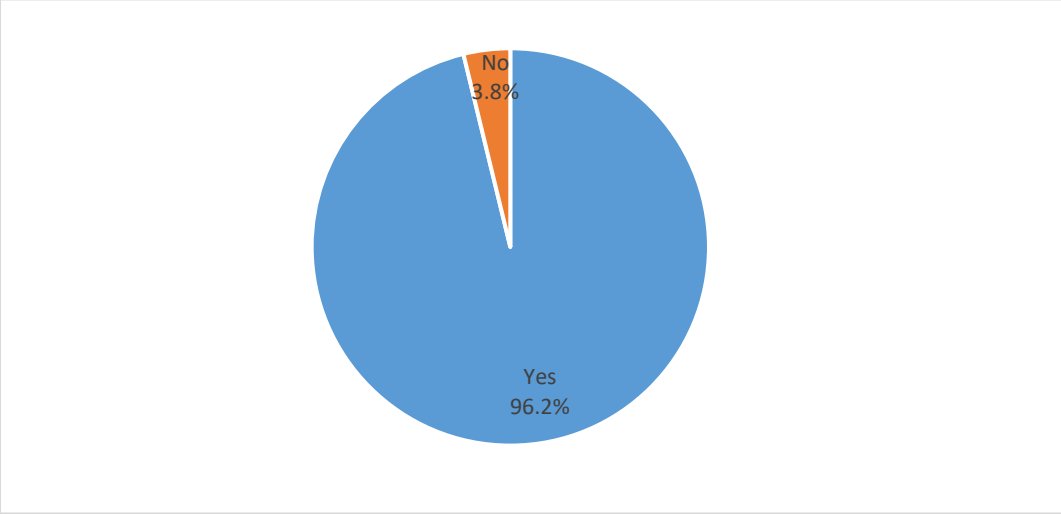

Figure 5: Importance of the Antibiotic stewardship programme

Table 2: Storage of Antibiotic

Factor	Number	Percentage
Storage facility for Antibiotics in the department, **N=73**		
In refrigerators	27	37.0
Kept by careers of patients	21	28.8
kept in the patient's bedside cabinets	16	21.9
Inward cabinets	9	12.3
Storage units have thermometers, **N=77**		
Yes	16	20.8
No	61	79.2
Average temperature for storage units, **N=10**		
0-10	4	40.0
31-40	1	10.0
Temperature not monitored	5	50.0

Discussion

There was no established antibiotic stewardship programme at the directorate, however, the majority of the participants acknowledged that the establishment of an ASP would promote the appropriate and responsible use of antibiotics. Participants involved in the study stressed the need for Pharmacists and Doctors to be key members of any ASP, and that one should be established as soon as possible. Some studies in Ghana and Europe have reported that health workers have seen the need for antibiotic use to be guided by policies and guidelines to curb the increasing rate of drug resistance. Pharmacists and Doctors are recognized as critical members of successful stewardship programmes (Asante *et al.*, 2017; Pulcini *et al.*, 2011; CDC, 2017).

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A significant number of the study participants confirmed the presence of protocol for antibiotic selection in the department but were not properly adhered to. However, respondents indicated that culture and sensitivity tests were the main guidelines considered by clinicians before prescribing antibiotics to patients. This is an important step in ensuring patients receive the right medication, dose and duration for infections, cut the length of stay in hospitals and the health budget and curbing the indiscriminate use of antibiotics to reduce antibiotic resistance. (Berkley *et al.*, 2005; Leekha *et al.*, 2010)

The majority of participants confirmed experiences of suspected treatment failure with affordable generic brands and a few cases of innovator brands of antibiotics. Globally, physicians are losing confidence in generic antibiotics due to reported cases of treatment failure. Drug regulatory agencies are most often able to test for the pharmacokinetic properties but not the pharmacodynamics or the therapeutic equivalence of medicines. This has resulted in a number of cases of poor clinical outcomes with many generic antibiotics. Again, free trade policies in parts of Africa have flamed easy transport of fake, counterfeit and substandard antibiotics (Del Tacca *et al*., 2009; Vesga *et al.*, 2010; Gyansa-Lutterodt, 2013; Rodriguez *et al.*, 2016).

Although clinicians admitted encountering cases of suspected treatment failure or drug resistance, the majority eluded to the fact that there was no procedure for reporting suspected drug resistance or treatment failure in the directorate.
Suspected adverse drug reactions were in most cases reported to superiors instead of filling out the ADR form. A significant number indicated they would fill out the ADR forms provided by the FDA of Ghana. These call for more education by the FDA on the documentation of ADRs in the approved form since most staff preferred reporting to their superiors. Studies in other parts of Ghana have indicated that physicians are well-educated in reporting adverse drug reactions. However, ADRs are under reported in Ghana and other parts of the globe.(Mayer *et al.*, 2010; Sabblah *et al.*, 2014; Cliff-Eribo *et al.*, 2015).

Participants indicated various places where antibiotics were kept during use in the wards. A significant number gave medicines to the careers of patients who may have little knowledge of adequate storage conditions for antibiotics. Antibiotics were acceptably stored in bedside cabinets or ward cabinets that had no thermometers or monitoring charts to monitor the appropriateness of storage conditions. In-patients are better stored in secured cabinets where the clinical staff to get access to it. Patients may, however, get access to information on drug administration (Gil *et al.*, 2012; Truter *et al.*, 2017).

The various antibiotics groups have various temperatures appropriate for their storage. Instructions for the storage of antibiotics as indicated by the manufacturers must be strictly adhered to. The condition of storage of antibiotics greatly affects their shelf lives, potency and efficacy. Inappropriate storage could lead to reduced efficacy and poor clinical outcomes in patients (WHO, 2003; York,1977).

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CONCLUSION

There was no antibiotic stewardship programme at the child health directorate and this could have resulted in poor monitoring of the efficacy of antibiotics and poor clinical outcomes. Participants acknowledged the importance of an antibiotic stewardship programme and the need to establish one in the directorate. Treatment failure was experienced more often with generic antibiotics than with innovator brands of antibiotics.

The majority of cases of adverse effects from medications were reported to superiors instead of filling out pharmacovigilance forms. Antibiotics kept in the wards were mostly kept at unknown temperatures in bedside cabinets and could have greatly affected the shelf life and efficacy of many antibiotics used in the directorate

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