Antibiotics Prescription for Febrile Outpatients: A Health Facility-Based Secondary Data Analysis for the Greater Accra region of Ghana

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Abstract

**Background** Misguided prescription of antibiotics is an important facilitator of the emergence and spread of antibiotic resistance. In the absence of the implementation of effective interventions to control antibiotic use, its consumption may increase out of proportion to requirements. Antibiotic stewardship interventions must be appropriately targeted and assessed to enhance the proper use of antibiotics. The objective of this study was to determine the factors associated with antibiotics prescription to febrile outpatients who seek care in health facilities within the Greater Accra region of Ghana.

**Methods** Secondary data obtained from a review of medical records of 2,519 febrile patients at the outpatient department of 6 health facilities in 3 municipalities during the baseline survey of a quasi-experiment in 2016 were used. The primary outcome was prescription of any antibiotic. Independent variables included patients’ demographics, symptoms, laboratory investigations (blood film microscopy, malaria rapid diagnostic test, full blood count, urine and stool routine examinations), diagnoses, and prescribers’ demographics. Crude and adjusted logistic regression analyses were used to determine the factors associated with antibiotics prescription.

**Results** The prevalence of antibiotics prescription was 70.1% (95% CI: 67.7–72.4). Prescribers with more years of practice (> 5 years) were more likely to prescribe antibiotics compared to those with less than 3 years of practice (p < 0.001). Integrated Management of Neonatal and Childhood Illnesses (IMNCI) training was associated with a 2.3 (95% CI: 1.54, 3.53, p < 0.001) times higher odds of antibiotic prescribing. Patients aged 5 years or more were 60% less likely to be prescribed antibiotics compared with those under 5 years (AOR = 0.40, 95% CI: 0.32, 0.51; p < 0.001). Patients referred for laboratory investigations were 29% less likely to be prescribed with antibiotics than those not referred. Presenting to the outpatient clinic with cough was associated with a 3.5 (95% CI: 2.54, 4.92) times higher odds of antibiotics prescribing.

**Conclusion** Prescription of antibiotics to febrile outpatients was high. Promoting laboratory testing can potentially reduce irrational antibiotics prescribing. Prescribing antibiotics for children under five and the prescribing practices of prescribers with longer years of practice should be targeted with
interventions to reduce high use of antibiotics.

Background

Antibiotic resistance is a major global health challenge. Frequent or misguided consumption of antibiotics are critically important facilitators of the emergence and spread of antibiotic resistance [1, 2]. Higher consumption is not only associated with antibiotic resistance at the individual level but also at the community, national and regional levels, with implications for all patients [2]. A study of the global consumption pattern of antibiotics found that antibiotic consumption increased by 65% between 2000 and 2015 [3]. This study further estimates that antibiotic consumption will increase out of proportion to requirements by 2030, if no new policy interventions are implemented.

Developing countries contribute disproportionately more to the increasing trend of antibiotic consumption than developed countries [3–5]. Owing to the poor availability of data, antibiotic use in these countries is not optimally understood [5]. In African communities, high and inappropriate use of antibiotics have been shown to be widespread [6–8]. The prevalence of antibiotics prescription in selected hospitals across Africa has been estimated to be 50% [8]. This is the highest of all the WHO regions. A comparable point prevalence (51.4%) was determined by an antibiotic-use-survey at a teaching hospital in Ghana [9]. Inappropriate prescription of antibiotics has also been established among prescribers in other parts of Ghana [10, 11]. The phenomenon is driven by patients’ demands, poor quality laboratory services, pressure from pharmaceutical companies’ promotional activities, and health worker factors such as non-adherence and lack of access to institutional guidelines and also poor knowledge [12, 13].

Interventions which have been introduced to reduce irrational prescription of antibiotics in Ghana include the Standard Treatment Guidelines (STG) and Essential Medicines List (EML), provision of training and supervision for health care providers and mass education of the public [14]. To ensure rational use of antibiotics and delay potential development of antimicrobial resistance, the Ghana National Policy on antimicrobial use and resistance has been introduced [15].

For these interventions to be successful, the determinants of the prevailing undesirable patterns of antibiotic use need to be identified and appropriately targeted in local antibiotic stewardship
education [16]. In the long run, these activities should lead to a reduction in the rate of emergence of bacterial resistance, hospital visits, medical costs and the incidence of side effects [17, 18]. The knowledge gained will be key to informing the policy changes necessary for reversing the increasing trend of antibiotic consumption at all levels.

To these ends, the objective of this study was to determine the factors associated with prescription of antibiotics for febrile outpatients who sought care in health facilities within the Greater Accra region of Ghana using data from the last quarter of 2015.

**Methods**

Data for the current study were obtained from the baseline survey of a quasi-experimental study, which sought to develop and assess the effectiveness of a one-way text messaging intervention on health providers’ adherence to malaria case management guidelines [19]. The survey was conducted in Ga South, La Dade-Kotopon and La-Nkwantanang Madina municipalities in the Greater Accra region from October to December 2015.

A data extraction tool was used to obtain information from the folders of 2519 febrile outpatients in 6 health facilities, 2 in each of the 3 municipalities. It captured information on demographic characteristics, National Health Insurance Scheme (NHIS) membership, presenting symptoms, laboratory investigations requested (including blood film microscopy or malaria rapid diagnostic test, full blood count (FBC), stool examination for parasitic infections (stool routine examination) and simple urine examination for protein and haematuria (urine routine examination), diagnoses and prescribed drugs including information on the dosage regimen. Further to that, the 82 prescribers who saw the outpatients were interviewed using a structured questionnaire. This questionnaire captured information on prescribers’ demographics, exposure to in-service training on Malaria case management (MCM) and integrated management of neonatal and childhood illnesses (IMNCI), access to guidelines or other reference materials on MCM, and exposure to supervision in the past six months.

These febrile outpatients were neither detained for observation nor admitted on the ward but treated on ambulatory basis at the outpatient departments. Being febrile was defined as having a recorded
body temperature of 37.5°C or higher and/or having fever recorded in clinical notes on a survey day. Records of febrile outpatients who were pregnant or who attended for review of previous illnesses were excluded.

**Sampling**
Total enumerative sampling was used to select folders of all eligible febrile outpatients daily until the sample size allocated to each municipality was reached. Details on the data extraction tools and detailed methodology of the baseline survey has been published elsewhere [19].

**Measurement**
The entire data obtained from the primary study were validated and analysed using Stata Version 14 [20]. For the purposes of this study, diagnoses of interest was defined as all diagnoses which had a prevalence of at least 5% in the database. Those below 5% were excluded because their frequencies were low, yet, they were so many to have led to overfitting the data. Some of the diagnoses that were excluded include hypertension, bacteraemia, nephritis, mastitis, and diabetes mellitus.

The outcome variable, prescription of antibiotics, was derived based on whether or not at least 1 antibiotic was prescribed for the patient. A prescribed medicine was considered an antibiotic if it was so classified by the WHO Anatomical Therapeutic Chemical classification, J01 (Antibacterials for systemic use) and P01AB (nitroimidazole derivatives) [21].

**Data Analysis**
The distribution of categorical variables such as sex, the presenting symptoms, the diagnoses and laboratory investigations were assessed using frequencies. For continuous variables such as age, normality was assessed using histograms. To adjust for clustering, unique identifiers for each patient folder and for the municipalities were chosen as primary sampling units and stratum identifiers, respectively. Univariable logistic regression analyses were used to estimate unadjusted odds ratios for all the independent variables. The variables which were significantly associated with antibiotic prescribing (p < 0.05) were used to fit a multivariable logistic regression model. Although sex of patient was not significant in the crude analysis it was included in the adjusted model because it was considered a potential confounder. The factors in the adjusted model were checked for multicollinearity using the “collin” command in Stata 14. A variance inflation factor (VIF) of less than
was considered acceptable. There were 1.19% of missing values for patient age and 1.51% for years of practice, totalling 2.74% of the 2519 observations. This was anticipated and adjusted for in the determination of the sample size in the original study. Missing data were addressed using listwise deletion. Adjusted Wald test was used to determine the significance of multilevel categorical variables in the model. Missing values were Cluster-Robust standard errors were estimated for all models. Statistical significance was set at $p < 0.05$.

Results

A total of 2,519 valid records of patients, who had received care at the selected health facilities in Accra, were used for the study. Patient and facility level descriptive characteristics are presented (Table 1). Of patients prescribed with antibiotics, 4 out of 10 were aged above 5 years. It must be noted that 1.2% of the folders did not have age recorded in them. The proportion of females prescribed with antibiotics was 51.9%. Regarding registration with the main social health insurance scheme in Ghana, the national health insurance scheme (NHIS) or other schemes, 57.6% of patients were registered.
Table 1

Facility and patient level descriptive characteristics by antibiotic prescription

| Antibiotics prescription | Not Prescribed | Prescribed | Total, N = 2,519 |
|--------------------------|----------------|-----------|-----------------|
|                          | n | %<sup>a</sup> | n | %<sup>a</sup> | n | %<sup>b</sup> |
| Municipality             |   |          |   |          |   |          |
| Ga South (N = 811)       | 148 | 74.7 | 430 | 70.1 | 578 | 71.3 |
| Ga South Municipal Hospital |   |          |   |          |   |          |
| Ngleshie Amanfrom Health Centre | 50 | 25.3 | 183 | 29.9 | 233 | 28.7 |
| La Dade Kotopon (N = 802) |   |          |   |          |   |          |
| La General Hospital      | 78 | 35.5 | 215 | 36.9 | 293 | 36.5 |
| Police Hospital          | 142 | 64.5 | 367 | 63.1 | 509 | 63.5 |
| La Nkwantanang Madina (N = 906) |   |          |   |          |   |          |
| Kekele Polyclinic        | 145 | 43.3 | 71 | 12.4 | 216 | 23.8 |
| Pentecost Hospital       | 190 | 56.7 | 500 | 87.6 | 690 | 76.2 |
| Patient age-group < 5    | 186 | 24.7 | 963 | 54.5 | 1149 | 45.6 |
| ≥ 5                      | 552 | 73.3 | 788 | 44.6 | 1340 | 53.2 |
| Unknown                  | 15 | 2.0 | 15 | 0.9 | 30 | 1.2 |
| Sex                      |   |          |   |          |   |          |
| Male                     | 343 | 45.6 | 848 | 48.0 | 1191 | 47.3 |
| Female                   | 410 | 54.4 | 917 | 51.9 | 1327 | 52.7 |
| Client on NHIS           |   |          |   |          |   |          |
| Yes                      | 426 | 56.6 | 1026 | 58.1 | 1452 | 57.6 |
| No                       | 327 | 43.4 | 740 | 41.9 | 1067 | 42.4 |

ABBREVIATION: NHIS, national health insurance scheme; a: Proportion of those prescribed or not prescribed antibiotics; b: proportion based on total number seen in the municipal facility

The distribution of symptoms of the patients by age group is presented (Table 2a). A total of 11,953 symptoms were recorded. While headache (10.5%) was generally the most frequently reported symptom, nasal congestion (11.6%), poor appetite (11.2%), cough (10.3%) and watery stool (8.4%) were more frequently reported among the children under 5.
Regarding the number of years they had been prescribed antibiotics, approximately half (49.2%) were written by physician assistants, 43.9% by nurse prescribers.

Table 2 shows the distribution of diagnoses by age group. On average, 4 (10,026/2519) diagnoses were made per patient. Generally, the predominant diagnosis was ARTI (11.0%). Among the under 5 age group, this pattern of ARTI being the most frequently diagnosed condition was observed (12.7%). However, for all the other age groups, malaria was the most frequently diagnosed condition; 10.7%, 5–14 years; 11.1%, 15–29 years; 10.4%, 30–44 years; 10.4%, ≥ 45 years.

Table 3 presents a summary of the prescriber-patient interactions regarding antibiotics prescriptions at the health facilities during the period when the records were taken. Overall, the prevalence of antibiotics prescription was 70.1% (95% CI: 67.7% – 72.4%). Age-group stratified analyses showed that prevalence of antibiotic prescription was 83.8% (95% CI: 81.3–86.1) among patients under 5 and 58.8% (95% CI: 55.7–61.9) among patients aged 5 years or more. Of the 1766 prescriptions that had antibiotics prescribed, approximately half (49.2%) were written by physician assistants, 43.9% by medical doctors and 5.7% by nurse prescribers. Regarding the number of years they had been
practising, 31.4% of the patients were seen by prescribers who had been practising for less than 3 years, a little over a third (37.7%) had been practising for 3 to 5 years, and 30.9% had been practising for 6 years or more. The largest proportion of the prescriptions with antibiotics were written by prescribers who had been practising for 3 to 5 years (37.4%). While 79.4% of the prescriptions with antibiotics were written by prescribers who had never been trained on integrated management of neonatal and childhood illnesses (IMNCI), 87.9% of the prescriptions without antibiotics were written by those with no training on IMNCI.

Medicines prescribed other than antibiotics included antimalarials, analgesics, haematinics, cough remedies, antacids. The proportion of those prescribed antimalarials was 54.2% (408/753) among those who were not prescribed antibiotics and 35.6% (628/1766) among those who were prescribed antibiotics.

| Prescriber Characteristic | Antibiotics prescription | Not prescribed | Prescribed | Total, N = 2519 |
|---------------------------|--------------------------|----------------|------------|----------------|
|                           |                          | n   | %    | n   | %    | n   | %    |
| Prescriber's Profession   |                          |     |      |     |      |     |      |
| Medical Doctor            |                          | 289 | 38.4 | 776 | 43.9 | 1065 | 42.3 |
| Physician Assistant       |                          | 432 | 57.4 | 669 | 49.2 | 1301 | 51.6 |
| Nurse prescriber          |                          | 24  | 3.2  | 100 | 5.7  | 124  | 4.9  |
| Other                     |                          | 8   | 1.1  | 21  | 1.2  | 29   | 1.2  |
| Total                     |                          | 753 | 100.0| 1766| 100.0| 2519 | 100.0|
| Prescriber's years of practice |                      |     |      |     |      |     |      |
| < 3                       |                          | 279 | 37.7 | 500 | 28.7 | 779  | 31.4 |
| 3-5                       |                          | 284 | 38.4 | 652 | 37.4 | 936  | 37.7 |
| 6-9                       |                          | 99  | 13.4 | 289 | 16.6 | 388  | 15.7 |
| ≥ 10                      |                          | 78  | 10.5 | 300 | 17.2 | 378  | 15.2 |
| Total                     |                          | 740 | 100.0| 1741| 100.0| 2481 | 100.0|
| Ever trained on IMNCI     |                          |     |      |     |      |     |      |
| Yes                       |                          | 91  | 12.1 | 363 | 20.6 | 454  | 18.0 |
| No                        |                          | 662 | 87.9 | 1403| 79.4 | 2065 | 82.0 |
| Total                     |                          | 753 | 100.0| 1766| 100.0| 2519 | 100.0|
| IMNCI - Integrated management of childhood illnesses. |

A total of 1109 (44.0%) of patients were referred for laboratory investigations, 1007 (40.0%) were tested for malaria, 909 (36.1%) took the full blood count test, 9 (0.4%) took the stool routine examination, and 146 (5.8%) took the urine routine examination.

Results of the multivariable logistic regression analyses (Table 4a) identified the following as significant non-clinical factors of antibiotic prescription: location of facility (municipality), age of
patient and prescriber’s professional category, years of practice, and training in IMNCI. Compared to prescribers who had practised for less than 3 years, those who had 6 to 9 years of practice experience and those who had practiced for 10 years or more had 3 times (AOR = 2.97; 95% CI: 1.99–4.44) and 1.6 times (AOR = 1.60; 95% CI: 1.12–2.27) higher odds of prescribing antibiotics, respectively.

Patients treated by clinicians with 3 to 5 years of practice experience were not significantly different from those treated by clinicians with less than 3 years of practice. Prescribers who had ever been trained on IMNCI had 2.3 times greater odds of prescribing antibiotics than those who had never been trained (AOR = 2.33; 95% CI: 1.54–3.53). After adjusting for all the other covariates, children aged 5 years or above were 60% (AOR = 0.40; 95% CI: 0.32–0.51) less likely to be prescribed antibiotics than those under 5.

The significant clinical factors as identified from the multivariable logistic regression (Table 4b) include laboratory investigation, symptoms including cough, dizziness, difficulty in swallowing, watery stool, and diagnoses including urinary tract infection, typhoid fever, and skin disease. Patients who presented with cough were 3.54 times more likely to be prescribed antibiotics than those who did not cough (AOR = 3.54; 95% CI: 2.54–4.92). Patients for whom laboratory investigations were requested were 29% (AOR = 0.71; 95% CI: 0.57–0.89) less likely to be prescribed antibiotics than those for whom laboratory investigations were not requested. Sex of patient, symptoms including general body pains,
nasal congestion and diagnoses including ARTI and pneumonia were not significant factors of antibiotic prescribing (p < 0.05).

Table 4

| Factors                              | Crude OR (95% CI) | p-value   | Adjusted OR (95% CI) | p-value   |
|--------------------------------------|-------------------|-----------|----------------------|-----------|
| Cough (Ref: No)                      | < 0.001***        |           | < 0.001***           |           |
| Yes                                  | 3.28 (2.57, 4.19) | 0.033*    | 3.54 (2.54, 4.92)    | < 0.001***|
| Dizziness (Ref: No)                  | 0.81 (0.66, 0.98) |           | 0.48 (0.33, 0.71)    | < 0.001***|
| Difficulty in swallowing (Ref: No)   | 0.001**           |           | 7.78 (3.43, 17.64)   | < 0.001***|
| Yes                                  | 2.87 (1.51, 5.44) |           | 0.044*               |           |
| Watery stool (Ref: No)               | 1.24 (1.01, 1.53) |           | 1.56 (1.04, 2.34)    |           |
| General body pain (Ref: No)          | 0.019*            |           | 0.104                |           |
| Yes                                  | 0.79 (0.65, 0.96) |           | 0.79 (0.59, 1.05)    |           |
| Nasal congestion (Ref: No)           | 0.001***          |           | 0.003**              |           |
| Yes                                  | 1.67 (1.36, 2.04) |           | 1.30 (0.94, 1.80)    |           |
| Laboratory investigations (Ref: No)  | 0.62 (0.51, 0.74) |           | 0.71 (0.57, 0.89)    |           |
| Pneumonia (Ref: No)                  | 1.27 (1.02, 1.60) |           | 1.57 (0.85, 2.88)    |           |
| Acute respiratory tract infection (Ref: No) | < 0.001*** |           | 0.728                |           |
| Yes                                  | 1.80 (1.44, 2.25) |           | 0.95 (0.70, 1.28)    |           |
| Typhoid fever (Ref: No)              | 0.015*            |           | < 0.001***           |           |
| Yes                                  | 1.32 (1.06, 1.66) |           | 3.78 (2.28, 6.26)    |           |
| Urinary tract infection (Ref: No)    | 0.001***          |           | 0.02*                |           |
| Yes                                  | 1.51 (1.20, 1.89) |           | 1.82 (1.10, 3.02)    |           |
| Skin disease (Ref: No)               | 1.54 (1.07, 2.20) |           | 3.53 (2.23, 5.60)    |           |

The age-stratified analyses in both crude and adjusted models showed that prescriber training on IMNIC was not significantly associated with antibiotic prescription in patients under 5 years but significantly associated among patients who were 5 years or more (Table 5).

Table 5

| Less than 5 years | COR (95% CI) | p-value | AOR (95% CI) | p-value |
|-------------------|--------------|---------|--------------|---------|
| Prescriber ever trained on IMNIC (Ref: No) | 1.36 (0.86, 2.13) | 0.189 | 2.05 (0.99, 4.25) | 0.055 |
| 5 years or more   | Prescriber ever trained on IMNIC (Ref: No) | 1.93 (1.31, 2.84) | 0.001 | 2.44 (1.47, 4.05) | 0.001 |

The most prevalent diagnosis among the patients was ARTI (Fig. 1). The diagnoses not found to be significantly associated with antibiotic prescription were malaria, diarrhoeal diseases, anaemia, ear infection, eye infection, enteritis, trauma and tonsillitis (Table 2b). The other diagnoses that were not included in the analyses include hypertension, bacteraemia, nephritis, mastitis, diabetes mellitus.

Diagnoses of interest: all diagnoses which had a prevalence of at least 5% in the database

The variance inflation factor (VIF) for the exposure variables in the model were all less than 10
(Table 6), as such none of the variables were considered collinear with any other.

### Table 6

| Variable                              | Variance Inflation Factor |
|---------------------------------------|---------------------------|
| Profession                           | 1.51                      |
| Years of Practice                    | 1.07                      |
| Prescriber ever trained on IMNCI     | 1.23                      |
| Prescriber sex                       | 1.04                      |
| Municipality                         | 1.61                      |
| Age                                  | 1.33                      |
| Cough                                | 1.83                      |
| Dizziness                            | 3.94                      |
| Difficulty in swallowing             | 1.05                      |
| Watery stool                         | 3.26                      |
| General body pain                    | 2.60                      |
| Nasal congestion                     | 2.33                      |
| Laboratory investigation             | 1.07                      |
| Pneumonia                            | 6.89                      |
| Acute Respiratory Tract Infection    | 1.57                      |
| Typhoid fever                        | 4.58                      |
| Urinary tract Infection              | 2.91                      |
| Skin infection                       | 1.10                      |

**Discussion**

We aimed to determine the factors associated with antibiotic prescription for febrile outpatients. The major factors identified were prescriber’s profession and years of practice, age of patient, presenting symptoms including cough, watery stool, dizziness, difficulty in swallowing, laboratory tests, diagnoses including typhoid fever, urinary tract infection and skin disease.

A high prescription of antibiotics for febrile outpatients was observed. The prevalence of prescribing antibiotics, which was 70.1% (95% CI: 67.7–72.4) was higher than was found among febrile outpatients in Zambia [22]. An important difference observed between the 2 studies which could explain the difference in prevalence is that a higher proportion of the febrile outpatients (74.6%) underwent diagnostic testing in the Zambian study than in the present study (44%). Studies in Uganda [23] and Cameroon [24] have shown that laboratory testing reduces the odds of antibiotic prescribing. Our findings showed that when laboratory investigations were requested prior to prescribing, patients were less likely to be prescribed with antibiotics. This was observed although the laboratory tests requested did not include culture test or any non-malaria point-of-care testing for infections. Advocating for the increased use of point-of-care tests for infections could improve the control of antibiotic prescribing. Despite the scarcity of resources, it must be considered that the ultimate cost of overprescribing antibiotics outweighs the cost of the optimal use of laboratory services.
The prevalence of antibiotics prescription in our study is higher than has been reported by other studies in Ghana, and other developing countries [9, 25]. A critical difference between our study and these other studies is that only febrile patients were included in the current study. The higher use of antibiotics among febrile outpatients may not be justified since a majority of the infections targeted are mostly caused by viruses [26, 27].

Elsewhere, respiratory tract infection has been shown to be predictive of antibiotic prescription [24, 28, 29]. Other studies in Ghana also observed a high prescription of antibiotics for ARTI management at health facilities [30, 31, 32]. In this study, the observation that neither ARTI nor pneumonia is significantly associated with antibiotic prescribing seems progressive (Table 3b).

The finding in our study is suggestive of prescribers appreciating that these diseases are more likely to be caused by viruses rather than bacteria [33, 34] or that using antibiotics to treat these diseases provides no clear benefit [35, 36]. This understanding may be translated to the treatment of febrile illnesses at large, since these principles apply generally but were not reflected in the findings. Cough is often associated with respiratory infection of one kind or the other. It seems paradoxical that it was found to be significantly associated with antibiotic prescribing whilst ARTI was not. Accordingly, a patient who presents with cough is likely to be prescribed an antibiotic, irrespective of whether ARTI or pneumonia is diagnosed. This raises the question of whether prescribers treat symptoms rather than the diseases they diagnose. Another related observation is that patients who present with watery stool are likely to be treated with antibiotics though same cannot be said when diarrhoea is diagnosed. Further studies are required to investigate this practice.

That prescribers with more than 5 years of practice experience are more likely to prescribe antibiotics than those with less experience is at variance with a study conducted in Italy [37] but similar to another study in Canada [38]. Prescribers with fewer years of experience, who ordinarily may not have been promoted to the next level see themselves as amateurs and thus are more likely to adhere to guidelines and probably not rush to prescribe antibiotics. However, those with more than 6 years’ experience probably see themselves as experts, working as either Senior prescriber or above the rank of a senior prescriber, so may prescribe based on some experiences. The prescribing practices of
more experienced prescribers must be targeted by antibiotic stewardship interventions. Though inadequate training of prescribers has been shown to worsen antibiotic prescribing [39] we found that those not trained on the IMNCI have lower odds of prescribing antibiotics. The subgroup analyses, however, showed that this was the case only among adult patients. It is noteworthy that IMNCI training is not implemented for the management of adult illnesses. That notwithstanding, it must be pointed out that one approach recommended by IMNCI is the active involvement of patients or caregivers in deciding on treatments [40]. This approach, however, has been suggested as influencing high antibiotic prescribing [41]. Since the prescribers who attend to children in these facilities also attend to adults, it may be necessary to point out and address the tendency for higher use of antibiotics in adults.

Regarding age, we found that patients aged 5 years or more had lower odds of being prescribed antibiotics. A similar observation was made in Cameroon [24]. Children under five, as a result of having less developed immune systems are more susceptible to infections than older people. Prescribers are more likely to manage illnesses of children in this age group with antibiotics than in older age groups. Also, the higher rate of mortality among children under 5 may condition prescribers to prefer erring cautiously by prescribing antibiotics given that treatments are usually done empirically. This is occasioned by the resource constraints of the health facilities and relatively expensive diagnostic tests. This trend is worrying considering that high antibiotic consumption in childhood has been linked with the development of metabolic diseases in later life [42].

We conducted a literature search on PubMed and Google scholar, and to the best of our knowledge this is the largest study on antibiotics prescription in Ghana. The relatively large sample size allowed for the inclusion of several factors in the assessment. One limitation of this study is that the period of the data collection was short (3 months). As such, seasonal variations in antibiotics prescription was not accounted for. Another limitation of this study is the assumption that all documented actions were carried out. Similarly, all undocumentd actions were assumed not to have been taken. This may have introduced misclassification bias but was considered more acceptable than direct observation which may have caused prescribers to vary their usual prescribing habit. Also, behavioural factors
were not assessed. Finally, findings of this study may not apply to febrile patients who were admitted due to disease severity.

Conclusion
The factors associated with antibiotic prescription for febrile outpatients were prescriber’s profession and years of practice; age of patient; some presenting symptoms which included cough, watery stool, dizziness, difficulty in swallowing, laboratory tests; some diagnoses including typhoid fever, urinary tract infection and skin disease. In contrast, ARTI and pneumonia were not significantly associated with antibiotic prescription.

The rate of antibiotics prescription for febrile outpatients is high. To reduce this, advocacy for the increased use of laboratory testing prior to prescribing antibiotics is key. Also, more experienced prescribers and treatment for children under five should be targeted with interventions aimed at reducing antibiotic prescribing. IMNCI training appears to be counterproductive for controlling antibiotic prescribing in adults.

List Of Abbreviations
ARTI – Acute Respiratory Tract Infection
EML – Essential Medicines List
IMNCI – Integrated Management of Neonatal and Childhood Illnesses
NHIS – National Health Insurance Scheme
OPD – Outpatient department
STG – Standard Treatment Guidelines
UTI – Urinary Tract Infection
WHO – World Health Organization

Declarations
Ethics Approval and Consent to Participate

Ethical approval for the primary study was given by the Ethics Review Committee of the Ghana Health Service. Permission was further sought from the Greater Accra Regional Health Administration, the Municipal Health directorates of the study sites and the management of Health facilities and prescribers. Informed consent were obtained from all the prescribers who saw the patients whose
records were used.

Consent for publication

All medical superintendents of the six health facilities and the prescribers were adequately informed about the study and they consented to the publication of the research study findings. Adequate information about the original study was also placed at vantage points in all health facilities during the data collection period.

Availability of Data and Materials

The dataset is not publicly available. However, it can be accessed after a reasonable request has been sent to the corresponding author.

Competing Interests

The authors declare that they have no competing interests.

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German Academic Exchange Service Project provided funding for the original study-as part of funds for the PhD training program of the Corresponding author. They played no part in the conceptualisation, implementation and reporting of the study.

Authors' Contributions

HAB and MMO conceptualised the study under the supervision of KAK. HAB assisted MMO in the analysis phase. Interpretation was done by MMO, HAB and KAK. All the authors reviewed and approved the final manuscript for publication.

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Figures
Figure 1

Bar chart showing the prevalence of diagnoses of interest. ARTI, Acute Respiratory Tract Infection; UTI, Urinary Tract Infection

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