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Abstract

Parents' poor knowledge and expectations towards antibiotics use for children's Upper Respiratory Tract Infections are contributing factors of antibiotics misuse and the latter leads to the antimicrobial resistance. Thus, this study aimed at assessing parents' knowledge, attitudes and practices on antibiotics use for childhood URTIs in Kicukiro District, Rwanda. A cross-sectional study was conducted using a structured questionnaire for data collection from a sample size of 384 parents of under 12 years of age children attending selected Health Centers in Kicukiro District. (SPPS) version 21 was used for data analysis; Chi-square test and regression analysis were used to examine the association between dependent and independent variables. The study findings indicated that 88.5% of parents were female, 39.6% aged from 25 to 34 years, 81.8% were married, 42.2% completed secondary education, 50% had 2 to 4 children and 57% were in economic class 2. Only 23.2% of parents had high level of knowledge of antibiotics; 40.1% had positive attitudes and 62% had poor practices towards antibiotics use for childhood URTIs. Employed parents with increased level of education, in higher economic position demonstrated good practices towards antibiotics use. Parents' high level of knowledge and positive attitudes regarding antibiotics use had also good practices on antibiotics with AOR=13.371, 95% CI=[3.604-49.617], p<0.001, and AOR=0.309, 95% CI=[0.96-0.489], p<0.001 respectively, compared to their corresponding counterparts. In conclusion, majority of parents in Kicukiro District had low level of knowledge of antibiotic use, negative attitudes towards antibiotic use and poor practices towards antibiotics utilization for childhood URTIs. Factors associated with good parental practices towards ABs use for children's URTIs include having 5 or more children, higher education, employment, high economic class, high knowledge of antibiotics and positive attitudes towards ABs use. Health education for parents should be urgently done to reduce antibiotics misuse by raising awareness on their indications of antibiotics, side effects and the emergence of antimicrobial resistance.

Keywords: Antibiotics, Attitudes and Knowledge, Children, Misuse, Parents, Kicukiro District, Rwanda

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1.0 Introduction

Childhood Upper Respiratory Tract Infections (URTIs) are prevalent occurrence in primary health care settings (Yang, et al., 2014). These illnesses are taught to be the leading cause of children's or parents' absenteeism from school or from work, consequently posing a financial burden on parents and the health systems (West, 2018). Children become infected as a result of their exposure to a range of ailments and, in general, acquire 4 to 6 URTIs episodes yearly (Arrol et al., 2018). Evidence from literature showed that bacteria are responsible for less than 10% of URTI cases, yet antibiotics are frequently used to treat them and children get more antibiotics than any other age group (Dong *et al.*, 2018). It is believed that ten million needless antibiotics are provided each year, with broad-spectrum antibiotics being utilized in the majority of situations; this translates to over forty million US$ for antibiotic expenditures for treating the URTIs (Huttner *et al*., 2020).

Excessive usage or misuse of antibacterials has resulted in higher health-care costs, greater adverse reactions such as diarrhea, and emergence of Antibacterial Resistance (AMR) (Olesen *et al*., 2018). Research findings estimate that ten million deaths will occur each year as a result of AMR (O'Neill, 2016) and 40% of these deaths will happen in Africa (NCDC, 2017). As a result, the WHO has declared AMR as one of the world's top ten public health threats that human society has been facing over the last decade (Chan & Tang, 2016).

A study that examined the prevalence of AMR within Rwandan referral hospitals revealed that AMR rates were high, posing a great therapeutic challenge in managing common infectious diseases Ntirenganya et al., 2015). According to a recent analysis, 1 out of 3 people in (LMICs) has serious gaps in knowledge of antibiotics utilization (Davies & Davies, 2020). Physicians' doubt about diagnosis, parental preferences, mis-perceptions, unrestricted access to antibiotics, knowledge deficit regarding antibiotic indications, and an unawareness of AMR were all linked to greater rates of antibiotic prescriptions (Panagakou et al., 2017).

The views and expectations of parents play a big role in whether or not an antibiotic is prescribed. Fear of acute illnesses among parents results in many pediatrician visits for URTIs and, as a result, inappropriate antimicrobial utilization occur (Pechere, 2021). According to numerous studies conducted in Africa and beyond, factors that influence antibacterial use include parental educational level, age, economic position, number of children, gender, residence location among others (Ekwochi et al., 2014); (Jimah & Ogunseitan, 2020). Literature also revealed a correlation between parental KAP regarding antibiotics use (Sindato *et al*., 2020).

Studies conducted in Rwanda were mainly focused on AMR and the suitability of antibiotic prescription. A study conducted in 3 Health Centers in Gisagara District that was assessing found that 54.2% of medication prescription were antibiotics, main indication was URTIs at 40.6% and only 38.6% of these antibiotics were rational. This study indicated that children took numerous antibiotics for URTIs at 21.4% compared to others (Vedaste *et al.*, 2020). However, a very little is known about parents' Knowledge Attitudes and Practices towards antibiotics use for Rwandan children's URTIs in primary health care settings.

1.1 Statement of the problem

Antibiotics misuse has resulted in higher health-care costs, greater adverse reactions and Antibacterial Resistance (AMR) (Olesen *et al*., 2018) and the latter was classified as one of the world's top ten public health threats that human society has been facing over the last decade (Chan & Tang, 2016). Parents' knowledge and attitudes towards antibiotics utilization has been pointed out as major contributing factors for unnecessary AB prescriptions (Pechere, 2021). A very little is known about parents' KAP towards antibiotics use for childhood URTIs in, Rwandan. Therefore, this study aimed assessing parents' Knowledge, Attitudes, and Practices on antibiotic usage in selected health centers of Kicukiro District, Rwanda. The findings of this study will be beneficial for decision makers to design strategies for health education especially for susceptible parents for antimicrobial abuse. It will also be used to improve parents' understanding on URTIs and antibiotic use, thus, elements that influence long-term behavior changes regarding antibiotic usage.

1.2 Research Objective

The research objective of the study was to examine parents' Knowledge, Attitude, and Practices on antibiotic use for childhood URTIs in selected HCs in Kicukiro District, Rwanda.

2.0 Literature review

2.1 Theoretical Literature

The word "Antibiotic" came from the Greek word 'antibiosis,' meaning 'against life' (Sebelius, et al. 2019). Antimicrobial agents were once thought to be chemical molecules created by one bacteria that are poisonous to another by killing or suppressing the development of other microorganisms selectively (Russell, 2004). Antimicrobials manufactured partially (semi-synthetic) or entirely (synthetic) using synthetic techniques are included in this description. These drugs Antibiotics affect bacterial growth and survival by impeding cell wall production (cephalosporins and penicillins), protein synthesis (macrolides, tetracyclines, aminoglycosides, and phenicols), and finally DNA functioning (tetracyclines, macrolides, phenicols, aminoglycosides, and aminoglycosides) (sulfonamides and fluoroquinolones) (Couëtil et al., 2007).

Antibiotics are categorized as either bactericidal or bacteriostatic: Those with bactericidal effects have minimal inhibitory and bactericidal concentrations that are only a few dilutions apart when evaluated in the laboratory while those that slow or halt the development of bacteria without killing them are known as bacteriostatic antimicrobials, and they generally require a greater dose to inhibit visible growth in culture (Mouiche et al., 2020).

2.1.1 Historical Developments of Antibiotics and their use in human population

Alexander F. discovered the first antibiotic (Penicillin) from a soil-dwelling fungus called Penicillium notatum in In September 1928 (Aminov, 2010). The 1st human clinical trials were conducted in 1940, and the medicine saved 12-15 percent of casualties throughout WWII (Russell, 2004). Fleming was also the first to alert about the likelihood of penicillin

resistance if it was administered in too little dose or for too short time of treatment (Aminov, 2010). Other investigators got on board, producing in a rush of new ABs.

The antimicrobial invention golden period spanned from the 1950s through the 1970s, and no new antibacterial classes have been identified since then. As the discovery rate has declined, the conventional technique for generating new drugs to combat emerging and re-emerging antimicrobial resistant pathogens has been to modify current ABs (Chopra et al., 2002).

2.1.2 Absorption, Distribution, Metabolism, and Elimination

The four essential physiological processes that determine a drug's fate in the body over time are absorption, distribution, metabolism, and elimination (ADME). Pharmacokinetics, or the study of medicine concentrations in the body over time, can be used to measure ADME components. Pharmacokinetics is a valuable technique for establishing the most optimal medication dosage regimens for each individual patient when employed in a therapeutic environment. Dosing schedules and dose forms, understanding the fundamentals of pharmacokinetics will help you make more informed treatment decisions (Huttner et al., 2019).

2.1.3 Mechanism for Resistance to Antimicrobial drugs

Antibiotic resistance occurs when organisms such as bacteria and fungi gain the capacity to resist medications that are supposed to kill them. This implies that the germs are not eliminated and can continue to multiply (WHO, 2015).

A general process of AMR is a change in target, which mainly affects ribosomes, as well as a change in membrane permeability produced by a change in the drug's binding receptor. The evolution of antibiotic-inactivating enzymes such as beta-lactamase, aminoglycoside-modifying enzymes, and chloramphenicol acetyltransferases is another route. In 1940, the first β-lactamase was identified in 1940 (Garg, R., & Maurya, I., 2021). Finally, there are efflux pumps, which are Gram negative membrane proteins that pump out drugs, and metabolic pathway change, which is the formation of a new biological process.

2.1.4 Consequences of Antimicrobial Resistance

According to a WHO 2019 study, AMR is reaching frighteningly increased rates in all parts of the world, and it can affect anybody, of any age, in any country. New mechanisms of resistance are expanding at a rapid pace over the globe, jeopardizing our ability to treat microbial diseases. As these medicines grow less powerful, it becomes hard or impossible to treat diseases like pneumonia, tuberculosis, sepsis, gonorrhoea, and gastrointestinal infections.

Consequently, AMR increases mortality, lengthens hospital stays, and raises medical costs (WHO 2019). Likewise, Chua, Fischer and Linder (2019) added that AMR makes patient treatment difficult, expensive, and in some situations impossible and patients who are infected may face treatment failure or poor care. As a result, AMR's rise has been pointed out as a severe worldwide public health issue. Evidence suggests that infections produced by

antimicrobial-resistant microbes in health facilities are linked to higher morbidity, mortality, and healthcare expenses in general.

2.1.5 Potential side effects of antibiotic therapy in human population

Antibiotics are useful for treating serious and even deadly illnesses, but their overuse can lead to bacterial resistance and side effects. However, when prescribing any medicine, practitioners must weigh the possible benefit against the risk of side effects. A moderate risk of damage is acceptable when a medicine has a big potential benefit. When the reward is tiny, however, even a minor risk might be intolerable (Mohsen *et al.,* 2020). In a research done by (Mohsen *et al.,* 2020), it was discovered that all antibiotics tested can produce health problems like nausea, vomiting, diarrhea, stomach discomfort, lack of appetite and bloating, which is typically due to gut flora disruption.

2.2 Empirical Literature

2.2.1 Parents' knowledge on antibiotic and their use in children with URTIs

In most cases, children get four to six respiratory tract infections episodes per year. Despite the fact that bacteria are responsible for less than ten percent of URTI cases, antibiotics are frequently used to treat them (Arrol et al., 2018). Children are prescribed more antibiotics than any other age group, with colds, respiratory illness and bronchitis accounting for over 20% of paediatric antibiotic prescriptions.

A KAP study conducted in Palestine revealed that 59% of parents were not aware of causes of URTIs, 73% chose ABs as first option for treating those infections (Zyoud et al., 2015). In Namibia, Pereko et al., (2015) found that 64% of parents reported that antibacterials are effective against viral infections and less than 50% claimed that they would treat colds with ABs. However, 72% of them demonstrated good understanding the ineffectiveness of antimicrobials which could be caused by their abuse. Family awareness, beliefs, and attitudes have been found to be crucial aspects to examine when a shift in children's antibiotic usage is needed, according to Zolaly and Hanafi (2011).

When parents consult their doctor because they might be concerned about their child's illness (Moher, 2019), as a result, parental influence for AB prescription differed greatly between worldwide regions, including within the same geographic area. On the other hand, according to Cabral & Ingram (2014), clinicians may misinterpret parents' anxiety or information inquiry as pressure for AB prescribing, which might result in extreme abuse of ABs. According to a recent analysis, more than 30% of people in LMIC has serious gaps in knowledge in the subject (Davies & Davies, 2020). Enhancing relationship with parents and doctors could assist in minimizing use of pediatric AB for a variety of reasons.

2.2.2 Parents' attitudes towards antibiotics and their use in children with URTIs

Evidence from literature showed that parental attitude cloud affect their practices regarding antibiotics use for their children's URTIs. In the study conducted in Nepal, the majority (88.2%) of parents said that they would change physician and look for one who could prescribe ABs for their kids'URTIs (Nepal, 2019). Similarly, according to (Okide et al., 2020), 92.9% of Nigerian parents had requested ABs and 84.3% among them directly got

them after their request. This means that the quality of interactions between parents and clinicians is essential in deciding on medicine prescription. As a result of the increased prevalence of Respiratory Tract Infections (RTIs) and anxiety about probable consequences, children are particularly vulnerable to high rates of antibiotic use.

On the other hand, over-prescribing by clinicians is mostly caused by doubt about diagnosis and parental preferences and this is driven by knowledge deficit and mis-perceptions (Panagakou, 2017). According to a recent analysis, one-third of people in LMIC has serious gaps in knowledge in the subject (Davies & Davies, 2020). This means that the quality of interactions between parents and clinicians is essential in deciding on medicine prescription. Centinkaya, (2020) revealed a correlation with socio-demographic features and parents' knowledge, attitude and practices on antibiotic usage for URTIs.

2.2.3 Parents' practices towards antibiotics use in children with URTIs

Use of leftover antibiotics from previous treatments, taking antibiotics without consulting a health professional are among types of irrational use of antibiotics (Shlomo, Adi & Eliezer, 2018). Civil freedoms regarding antibiotic usage, a lack of understanding of antibiotic indications, and an unawareness of AMR were all linked to greater rates of consciousness (Ivan & Ting 2020). AMR is worsened by irrational usage of antibiotics and their use in non-therapeutic conditions, despite the fact that it is a natural biological phenomenon (Shlomo, Adi & Eliezer, 2018).

According to the (WHO, 2014), the prevalence of self-medication varies between 2 to 20% respondents across nations in the European Union (EU), Eastern and southern European nations have the highest rates, whereas those in northern and western Europe have the lowest. However, in the study conducted in Namibia, it was revealed that 78.3% of parents knew that use of ABs in inappropriate way could lead to AMR (Pereko et al., 2015), while 50% of participants from Jordan were aware of emergence of AMR and implication of improper use of ABs (Darwish et al., 2014).

2.2.4 Factors associated with parental practices on antibiotics use for childhood URTIs

According to Xiao and Li (2013), age, gender, educational status, and socio-economic positions, have been hypothesized to determine the type of antibacterial awareness and usage. Chen (2015) indicated that children whose parents were less educated consumed much more antibiotics. In the study conducted by Heddin, (2019), it was revealed that antimicrobial consumption is greater in parents who receive less supportive emotional care and in families under financial hardship. Agarwal *et al.*, (2015) added that the statistical significance of gender resulting from attitude towards antibiotic usage in women is remarkably precise. However, Chan and Tang (2018) indicated that as the educational level accrued, the utilization of correct antibiotics weakened.

This implies that inadequate and wrong information of literate individuals regarding ABs use can lead to this result. On the other hand, the study conducted in Tanzania, suggested that old age and high level of education together had a positive influence on the knowledge, attitudes and practices regarding antibiotic use and AMR. The same study revealed that the correlation

between knowledge and attitudes was moderate; and poor between knowledge and practices; and attitudes and practices (Sindato *et al*., 2020). Similarly, Jimah and Ogunseitan (2020) showed that knowledge, attitudes and antibiotic appropriate usage are connected with demographic parameters such as residence location, ethnicity, caregivers' age, sex and level of education.

3.0 Research Methodology

The study was based on cross-sectional research design and quantitative data were obtained from parents with under 12 years old children attending selected Health Centers, namely Masaka and Kabuga Kicukiro and Gikondo in Kicukiro District, Rwanda. A sample size of 384 respondents was obtained using Fisher formula (Fisher et al.,1991), and the convenience sampling technique was used. Structured questionnaire was as data collection tool, initially written in English and then translated to Kinyarwanda to facilitate better understanding and easy use by respondents.

Data Analysis was performed using SPSS software version 21, using descriptive statistics and presented as associated frequencies, mean and standard deviation. Chi-square test was used to test for association between variables and regression analysis was used to test the strengths of association between dependent and independent variables which were previously identified by Chi-square test. The level of significance (α) was set at 0.05 for all statistical tests and data were presented using tables and figures. For ethical aspects, researcher obtained approval letters from Mount Kenya University and from each of selected Health Centers as a permission for data collection. The respondents were explained about research topic, objectives and significance of the study and then researchers received signed consent from each participant before participating in the study and the participation in the study was voluntary.

4.0 Research Findings

4.1 Socio-demographic characteristics of respondents

Socio-demographic data presented in the Table 1 were obtained from 384 respondents who were reached and filled in the research questionnaires.

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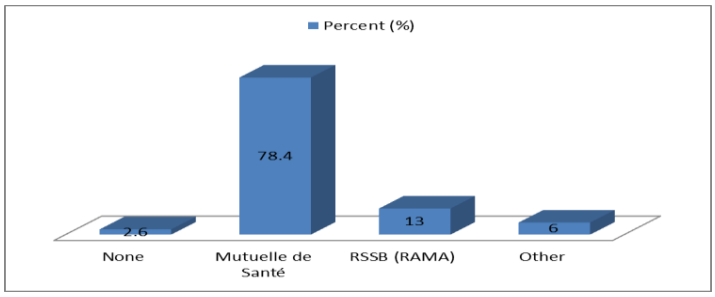
Table 1: Socio-Demographic Characteristics of Respondents

Variables		Frequency (n=384)	Percent (%)
Gender of respondents	Male	44	11.5
	Female	340	88.5
Age group of respondents in years	<25	83	21.6
	25-34	152	39.6
	35-44	132	34.4
	45 and above	17	4.4
Marital Status of Respondents	Single	15	3.9
	Married or cohabiting	313	81.5
	Divorced or Separated or Widow (er)	56	14.6
Educational attainment	No formal education	9	2.3
	Primary	166	43.0
	Secondary	163	42.7
	Higher education	47	12.0
Employment status of respondents	Employed	124	32.3
	Not employed	260	67.7
Economic class of respondents	Ubudehe Category 1	53	13.8
	Ubudehe Category 2	219	57.0
	Ubudehe category 3 or 4	112	29.2

Primary data (2022)

Findings in Table 1 indicated that majority were female (88.5%), 39.6% aged from 25 to 34 years old, 81.8% were married, 42.2% completed secondary education while only 12.2% of them completed university education. The majority, (67.7%) of respondents were not employed, more than half of them were in Rwandan economic category 2 (ubudehe category two).



RSSB: Rwanda Social Security Board

Figure 1: Respondents' health insurance*;*

In the Figure 1 findings shows that majority of 78.4% of respondents was having Mutuelle de Santé as their medical insurance. This was followed by 13.0% of respondents that mentioned that they have RSSB (RAMA) as their health insurance while 2.6% of respondents do not have health insurance. Other health insurances represent 6%.

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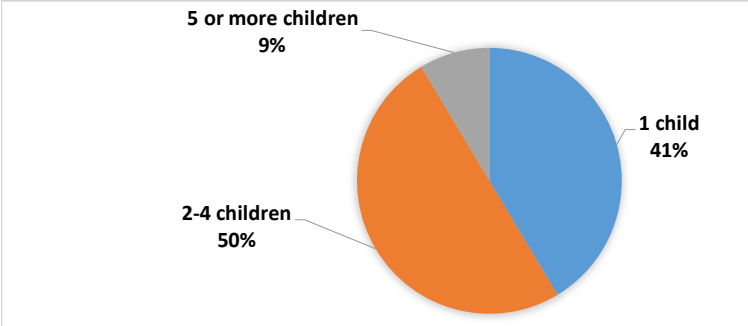

Figure 2:Respondents' Number of children

The Figure 2 shows that the majority corresponding with 50% of respondents had 2 to 4 children while 41.4% of respondents had only one child while 8.6% of them reported that they have 5children.

4.2 Parents' Knowledge of antibiotic use for childhood URTIs

The first objective of this study was to to determine parents' knowledge of antibiotics use for childhood URTIs in selected HCs of Kicukiro District. Results are presented in form of frequencies and percentage in Table 2 and Figure 3.

Table 2: Parents' knowledge of antibiotic use for childhood URTIs

Variables	Yes	No	Don't Know
	Freq(%)	Freq(%)	Freq(%)
Use of antibiotic for every feverish child	220(57.3)	98(25.5)	66(17.2)
Quick recovery when antibiotic is given for flu-like symptoms	262(68.2)	80(20.8)	42(11.0)
Antibiotics should not be given for URTIs since most of them are of viral origin and self-limited	80(20.8)	149(38.8)	155(40.4)
Antibiotic do not have any side effects	109(28.4)	120(31.3)	155(40.3)
Irrational use of antibiotics decreases their effectiveness and results in AMR	159(41.4)	79(20.6)	146(38.0
Researchers can discover new antibacterials for resistant microbes	195(50.8)	50(13.0)	139(36.2)
Antibacterials can cause secondary infection after killing normal flora	98(25.5)	87(22.7)	199(51.8)
Many infections are becoming resistant to anti-biotherapy	118(30.7)	54(14.1)	212(55.2)

Primary data (2022)

In the Table 2, findings demonstrated that 57.3% of parents incorrectly confirmed that every feverish child should be treated by antibiotics, 68.2% falsely confirmed that there is a quick recovery when antibiotic is give for URTIs with flu-like symptoms; Only 20.8% of them correctly confirmed that antibiotics should not be given for URTIs since most of them are of viral origin and self-limited. Yet, 40.4% of parents do not know whether or not side effects

can occur during antibiotic therapy, 74.5% don't know that antibiotic can cause secondary infection after killing normal flora while 41.1% correctly confirmed that irrational use of antibiotic decreases their effectiveness which causes AMR.

Parental level knowledge of antibiotic use

Parents who correctly answered to 6 or more questions out of 8 scored at ≥70% and were qualified as having 'high level of knowledge. Parents who correctly answered to 4-5 questions out of 8 scored at 50-69% and had 'moderate level of knowledge while those who correctly answered to less than 4 questions out of 8 got <50% had 'low level of knowledge as presented in the Figure 3.

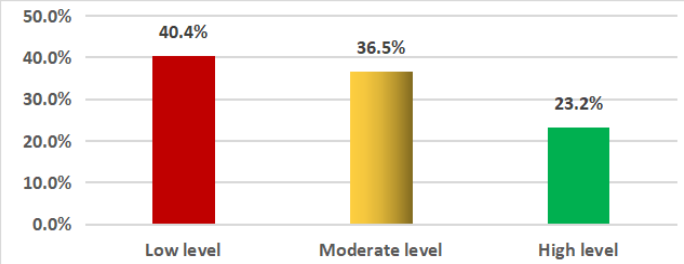

Figure 3: Parents' level of knowledge of antibiotics

Primary data (2022)

The Figure 3 indicates that 40.4% of parents have low level of knowledge of antibiotic use, 36.5% of them have moderate and only 23.2% of them have high level of knowledge of AB use.

4.3 Parents' attitudes towards antibiotic use for childhood URTIs

The second objective was to to determine parents' attitudes towards antibiotics use for childhood URTIs in selected HCs of Kicukiro District. Results are presented in form of frequencies and percentage in Table 3 and Figure 4.

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Table 3: Parents' attitudes towards antibiotic use for childhood URTIs

Statements	SA N (%)	A N (%)	U N (%)	D N (%)	SD N (%)	Mean	StD
Request antibiotics if suffers from frequent URTIs like flu or cold	37(9.6)	178(46.4)	70(18.2)	59(15.4)	40(10.4)	2.29	1.15
Preferring expensive antibiotics to accelerate the recovery from URTIs like flu or cold	45(11.7)	172(44.8)	80(20.8)	56(14.6)	31(8.1)	2.38	1.12
Buying antibiotics in private pharmacy when the physician refuses to prescribe them	47(12.2)	160(41.7)	31(8.1)	67(17.4)	79(20.6)	2.08	1.38
Change pediatrician and look for another one who can prescribe antibiotics for URTIs like flu or cold	65(16.9)	117(30.5)	41(10.7)	105(27.3)	56(14.6)	2.08	1.36
I feel unsatisfied with a Doctor's visit if no antibiotics prescribed for my child's URTIs	86(22.4)	118(30.7)	53(13.8)	80(20.8)	47(12.3)	2.30	1.34
Prefer giving antibiotics for child's flu or cold to prevent getting more serious illness	89(23.2)	189(49.2)	39(10.2)	33(8.6)	34(8.8)	2.69	1.18
Prefer giving antibiotics that may not be needed than waiting for recovery without them	69(18.0)	117(30.5)	61(15.9)	96(25.0)	41(10.6)	2.20	1.29
Antibiotics are safe, hence they can be commonly used for childhood URTIs	106(27.6)	97(25.3)	66(17.2)	65(16.9)	50(13.0)	2.38	1.38

Primary data (2022), SD: Strongly Disagree, D: Disagree, U: Undecided, A: Agree, SA: Strongly Agree, StD: Standard Deviation

From the Table 3, it was revealed that 56% of respondents would like to request antibiotics if their child suffers from frequent URTIs, the same number (56.6%) agreed that they prefer expensive antibiotics to accelerate the recovery while 53.9% confirmed that they prefer buying antibiotics in private pharmacy when the physician refuses to prescribe them. On the other hand, 56.2% confirmed that they would feel unsatisfied with doctors' visits if no antibiotics prescribed for their children's URTIs while they were expecting to receive them. A big number (73.4%) of respondents expressed that they prefer giving antibiotics for child's flu or cold to prevent getting more serious illness.

Parental level of attitude towards antibiotic use

The maximum total score was 40 (100%), and minimum was 8 (20%). Parents with positive attitudes scored at least at 28 (≥70%) and above; while those with negative attitude got 27 score or below (<70%) as presented in the Figure 4.

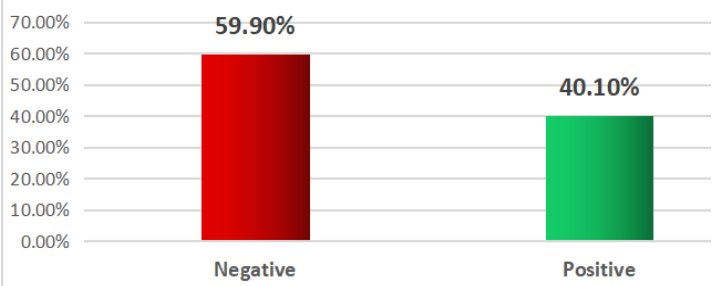

Figure 4: Level of parental attitudes towards antibiotics

Source: Primary data

The Figure 4 demonstrates that more than half, (59.9%) of parents have negative attitudes while 40.1% of them have positive attitudes towards antibiotic use for children's URTIs.

4.4 Parental practices regarding antibiotic utilization for childhood URTIs

The third objective was to assess parental practices regarding antibiotics utilization. Results are presented in form of frequencies and percentage in Table 4 and Figure 5.

Table 4: Parental practices regarding antibiotic use for childhood URTIs

Statements	Yes N (%)	No N (%)
To get a quick recovery of my child, I always give more antibiotics than the clinicians recommended.	173(45.1)	211(54.9)
I usually do not check expiration date of AB before I use it	233(39.3)	151(60.7)
I stop giving antimicrobial when I think my kids starts to recover	199(51.8)	185(48.2)
I reuse the remaining Abs when similar flu-like signs are present	173(45.1)	211(54.9)
I gave un-prescribed Abs to my child who had a high fever a few days in the past	168(43.8)	216(56.2)
I normally keep leftover Abs at home for a long time in case they are needed later	172(44.8)	212(55.2)
I use antibiotics more frequently if they are more widely available and less expensive	220(57.3)	164(42.7)

Source: primary data (2022)

The Table 4, demonstrates that majority, (60.7%) of parents confirmed that they do not usually check expiry date of antibiotic before giving it to their children, 51.8%) would stop giving antibiotics if they think their children start recovering from disease. On the other hand, 54.9% of parents didn't claim self-medication in few days in the past prior to the study, however, 45.1% of them confirmed the reuse of remaining ABs when similar flu-like

symptoms are present among family members, 44.8% confirmed that they I normally keep leftover Abs at home for a long time in case they are needed later.

Parental level of practice regarding antibiotic use

Parents with good practice were those who responded to all questions and scored at least at 5 (≥70%), corresponding to at least 5 out 7 possible appropriate responses; while those with poor practice got less than 5 score (<70%), corresponding to less than 5 out 7 possible appropriate responses as presented in the Figure 5.

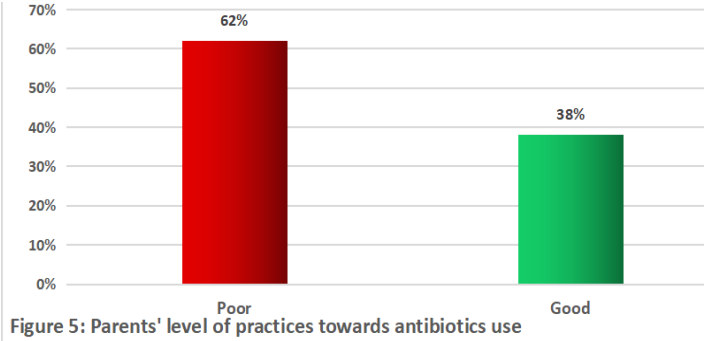

Figure 5: Parents' level of practices towards antibiotics use

Source: Primary data (2022)

The Figure 5 demonstrates that 62% of parents had poor practice and only 38% had good practices towards antibiotics utilization for children's URTIs.

4.5 Factors associated with practice of antibiotic use for childhood URTIs

The Table 5 demonstrates factors associated with parents practices towards ABs use.

Table 5: Factors associated with practice of antibiotic use for childhood URTIs

Variables		Level of parental practices		p-value
		Good, N (%)	Poor, N (%)	
Gender	Male	19(4.9)	25(6.5)	
	Female	127(33.1)	213(55.5)	0.455
Marital status	Single	4(1.0)	11(2.9)	
	Married or cohabiting	114(29.7)	199(51.8)	**0.026**
	Divorced or Separated or Widow (er)	28(7.3)	28(7.3)	
Number of children	1 child	77(20.1)	82(21.4)	
	2-4 children	61(15.9)	131(34.1)	
	5 or more children	25(6.5)	8(2.1)	**<0.001**
Ubudehe categories	Categories 1	13(3.4)	40(10.4)	
	Categories 2	95(24.7)	168(43.8)	
	Categories 3 &4	38(9.9)	30(7.8)	**<0.001**
Employment status	Employed	87(22.7)	37(9.6)	**<0.001**
	Not employed	72(18.8)	188(49.0)	
Educational level	Primary level	17(4.4)	157(40.8)	
	Secondary level	103(26.8)	59(15.4)	
	Higher education	26(6.8)	22(5.7)	**<0.001**
Health Insurance	None	2(0.5)	7(1.8)	
	Mutuelle de santé	69(18)	181(47.1)	
	RSSB	47(12.2)	38(9.9)	**<0.001**
	Other	28(7.3)	12(3.1)	
Level of Knowledge	Low level	32(8.3)	143(37.2)	
	Moderate level	73(19.0)	54(14.1)	
	High level	77(20.1)	5(1.3)	**<0.001**
Attitude	Negative	2 (0.5)	228 (59.4)	
	Positive	144 (37.5)	10 (2.6)	**<0.001**

Primary data (2022); p<0.05 is statistically significant; RSSB: Rwanda Social Security Board

From the Table 5, it was revealed that married or cohabiting parents with more than one child (p<0.026) parents belonging to economic class 3 and 4 (p<0.001), employed parents (p<0.001) with secondary and university educational (p<0.001), parents with RSSB as HI

(p<0.001),and parents with high level of knowledge of antibiotics (p<0.001), parents with positive attitude (p<0.0001) had significant better practices towards antibiotics than their corresponding counterparts.

4.6 Multivariate analysis for factors associated with antibiotic use for childhood URTIs

The Table 6 demonstrates the strengths of association between variables identified in Table 5.

Table 6: Multivariate analysis for factors associated with antibiotic use

Variables		AOR	95% CI	p-value
Marital status	Married or Cohabiting	Reference		
	Divorced or separated	1.2	0.642-1.745	0.125
	Widow (er)	0.82	0.245-1.445	0.253
Number of children	1 child	Reference		
	2-4 children	0.285	0.090-0.906	0.083
	5 or more children	3.683	1.062-12.771	**0.046**
Employment status	Employed	5.464	1.870-15.969	**0.002**
	Not employed	0.271	0.060-1.212	0.088
Ubudehe category	Ubudehe category 1	Reference		
	Ubudehe category 2	0.44	0.11-1.66	0.082
	Ubudehe category 3 or 4	2.840	1.237-6.523	**0.039**
Educational level	No formal education	Reference		
	Primary level	0.521	0.36-0.87	0.999
	Secondary level	0.855	0.65-1.25	**0.030**
	Higher education	4.371	1.725-11.077	**0.002**
Health insurance	None	Reference		
	Mutuelle de Santé	0.610	0.08-1.84	0.965
	RSSB(RAMA)	0.669	0.278-1.611	0.370
	Other private HI	0.553	0.281-1.085	0.085
Level of knowledge	Low knowledge	Reference		
	Moderate knowledge	1.272	0.313-5.163	0.736
	High knowledge	13.371	3.604-49.617	**<0.001**
Level of attitude	Negative	Reference		
	Positive	0.309	0.96-0.489	**<0.001**

Field data. ***AOR****:Adjusted Old Ratio****;*** ***CI****: Confidence Interval;* ***p-value****: probability value; p=<0.05 is* ***s****tatistically significant.*

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Findings in the table 6 indicate that parents who had 5 or more children were 3.683 times more likely to use antibiotics for children's URTIs compared to those with less than 5 children where AOR=3.683, 95% CI=[1.062-12.771], p<0.046.

Employed parents were 5.464 times more likely to appropriately use ABs compared to unemployed ones where AOR=5.464, 95% CI=[1.870-15.969], p<0.002. Parents in higher economic class were 2.840 times more likely to have good practices on ABs use compared to their counterparts where AOR=2.840, 95% CI=[1.237-6.523], p<0.039. Furthermore, parents with higher education were 4.371 times more likely to use antibiotics appropriately than those with low level of education where AOR=4.371, 95% CI=[1.725-11.077], p<0.002.

It is also indicated that parents with high level of knowledge were 13.371 times more likely to use ABs properly compared to those with low level of knowledge with AOR=13.371, 95% CI=[3.604-49.617], p<0.001, and those with positive attitude were 0.309 times more likely to properly use ABs than their counterparts with ARO=0.309, 95% CI=[0.96-0.489], p<0.001. However, the association between marital status and health insurance with antibiotics use were lost after regression analysis.

4.7 Discussions

The goal of our study was to examine parental knowledge, attitudes, and practices on antibiotics use for children' URTIs in Kicukiro District in Rwanda. Regarding knowledge of antibiotics, our study revealed that (40.4%) of parents had low level of knowledge while only 23.2% had high level of knowledge of ABs use. Highlights on low levels were observed on not knowing indications of antibiotics, awareness of potential side effects and AMR threat. Similar studies discovered the same concern about parent's low level of knowledge of antibiotics especially in LMICs.

Our study revealed that a three-quarter of parents don't know that antibiotics should not be given for all URTIs since most of them are of viral origin and self-limited. Our figures are similar to findings found in the study done in China where 79% of parents admitted that ABs could treat viral infections (Yu et al., 2014), slightly less than what was found in Ethiopian (83%) (Jifar, & Ayele, 2018), but higher than what was found in European Union (54%) (Grigoryan et al, 2007) and findings from Peru (50.2%) (Peredes et al., 2019).

These results from different regions could suggest a concern about poor parental knowledge of antibiotics worldwide. In the current study, almost a three-quarter of parents were not aware of side effects that can be caused by antibiotic therapy. Despite the evidence from literature showing that antibiotics can produce side effects like diarrhea, nausea, vomiting, stomach discomfort, lack of appetite, bloating after killing normal flora, majority of participants were not aware of this scientific truth. Not knowing potential side effects and other consequences of inappropriate use of antibiotics implies that parents can abuse antibiotics believing that there will be the replacement of ineffective antibiotics resulting from AMR. This also implies the need of health education on the usage of antibiotics among children and parental awareness on negative impact of their irrational use.

Regarding parental attitudes, our study indicated that slightly a half (59.9%) of parents had negative attitude towards antibiotics use among children suffering URTIs. Likewise, the

study conducted in Nepal indicated that 88.2% of parents would change a physician if they were not prescribed an antibiotic whenever they were expecting to receive them from their physicians (Stivers T, 2918). However, according to Okide et al., (2020), majority of Nigerian parents had positive attitude towards ABs use. Positive attitude could be linked to the increase of education where 79.4% of parents in Nigeria had higher education level. It could also be linked to existing educational interventions to on ABs use by implementing recommendations from previous studies done in the country. Parent' attitudes and expectations can result in pressure on clinicians pushing them to prescribe unnecessary antimicrobial or leading cause of self-medication hence one of leading causes of antibiotic overuse worldwide.

Regarding parental practices, the current study discovered that the majority (62%) of parents have poor level practices regarding antibiotic use for childhood URTIs. Slightly more than a half 51.8%) would stop giving ABs when they think that their children start getting better. Almost a half of reused the remaining ABs once same flu-like symptoms were present and 43.8% had self-medicated their children in the past few days prior to the study.

Likewise, only 66.4% Ethiopian parents said that they had completed recommended dose of ABs (Jifar & Ayele, 2018). On the other hand, our figures are less than what was found in Malaysia where 15 % of participants reused remaining ABs for other family members (Hu J et al., 2016). Evidence from literature confirmed the widespread of the practices of self-medication across nations both in developing and developed countries and this has been a major contributing factor to AMR worldwide. Educational intervention should emphasize on effect of stopping ABs, using leftover and keeping antibiotics for long time for the future use and the threat of AMR.

For factors associated with parental practices on antibiotic use, the current study discovered that parents who had 5 or more children were 3 times more likely to use antimicrobial properly. This improvement could be linked to their experience in dealing with children's illnesses and being aware that ABs don't help in case of viral infections based on their previous failed practices. Employed parents were 5 times more likely to appropriately use ABs while those in higher economic position were 2 times more likely to have good practices on ABs use than their counterparts. Furthermore, parents with higher education were 4 times more likely to use ABs appropriately than those with low level of education. Good practices among employed parents, highly educated parents, in higher economic class could be due to their advanced level of understanding, ability to get information related to antibiotics use from articles, workshop, social media etc. In most cases those who are educated are ones found in categories of employed which cloud justify the coincidence on good practices towards ABs Usage.

In addition, parents with high level of knowledge were 13 times to use ABs properly compared to those with low level of knowledge of antibiotics and those with positive attitude were 0.309 times more likely to appropriately use ABs than their counterparts. Similarly, evidence from literature showed that parental age, educational level, and economic position, have been determining the type of antibacterial awareness and usage (Xiao and Li (2013). Furthermore, it was discovered that there is a correlation between knowledge and attitudes

and practices regarding antibiotics use (Sindato et al.,2020); (Vedaste et al., 2020). From the above findings, it is clear that parental education should enhanced for improving knowledge of antibacterials especially on their indications, side effects and the awareness on emergence of Antimicrobial resistance which has been threatening human society locally, regionally and globally.

5.0 Conclusion

In conclusion, a big number of parents in Kicukiro District had low level of knowledge of antibiotic use, negative attitudes towards antibiotic use and poor practices towards antibiotics utilization for childhood URTIs. Factors associated with good parental practices towards ABs use for children's URTIs include having 5 or more children, higher educational level, employment, high economic class, high knowledge of ABs and positive attitudes towards ABs use. The lack of knowledge and negative attitude towards antibiotic use has been reported as one of leading causes of unjustified request of antibiotics, use of leftover, self-medication and interrupting the course of antibiotics among children suffering from URTIs.

6.0 Recommendations

Antibacterial misuse can be reduced by educational efforts for both parents and health care providers. Results of this study are critical in guiding policy development that can limit the acquisition of antimicrobials without a prescription in our setting. The planning and implementation of ABs use and AMR-related programs, focusing on community-based sensitization would also be crucial. Health care providers should advise parents not to provide un-prescribed ABs without and educate them about potential adverse effects and concern of AMR. Antibiotic indications, side effects, and the repercussions of their incorrect use should all be included in educational interventions for parents. Young parents, parents with a low level of education, and parents from poorer socioeconomic backgrounds should be prioritized for health education.

6.1 Suggestion for further study

There should be other studies that can be conducted in the whole country so that the findings can be extended enough and where can be relied on by formulating solutions countrywide.

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