The determinants of the uptake of Intermittent Preventive Therapy (IPT_p) for prevention of malaria in pregnancy in Uganda: Evidence from the Malaria Indicator Survey (MIS) 2018.

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The determinants of the uptake of Intermittent Preventive Therapy (IPTp) for prevention of malaria in pregnancy in Uganda: Evidence from the Malaria Indicator Survey (MIS) 2018.

By

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Table of contents

Declaration

Candidate's Declaration

I hereby declare that this dissertation is the result of my original work and that no part has been presented for another degree in this university or elsewhere.

Candidate's

Signature: …… Date: 30/07/2021 …….

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Abbreviation

ACT	Artemisinin-based Combination Therapy
ANC	Antenatal Care
CAPI	Computer Aided Personal Interviewing
CSA	Chondroitin Sulphate A
DHA-PQ	Dihydroartemisinin piperaquine
DFID	United Kingdom Department of International Development
HIV	Human Immunodeficiency Virus
ICF	Inner City Fund
IPT_p	Intermittent Preventive Therapy in pregnancy
IPT_p-SP	Intermittent Preventive Therapy using sulfadoxine-pyrimethamine
ITNs	Insecticide Treated Mosquito Nets
MiP	Malaria in Pregnancy
MoH	Ministry of Health
NMCD	National Malaria Control Program
PCR	Polymerase Chain Receptor
QNN	Quinine
RDT	Rapid Diagnostic Test
SES	Socioeconomic Status
TOTs	Trainer of Trainers
UBOS	Uganda Bureau of Statistics
UMIS	Uganda Malaria Indicator Survey
USA	United States of America
USAID	United States Agency for International Development
USD	United States Dollar
WHO	World Health Organisation

Abstract

Background: Malaria in pregnancy is associated with adverse outcomes on the mothers such as maternal deaths, anaemia, stillbirths, hypoglycaemia, miscarriage, and preterm birth. One of the key interventions for the prevention of malaria in pregnancy in Uganda is the uptake of Intermittent Preventive Therapy during antenatal visits, therefore this thesis aimed to investigate the determinants of the uptake of Intermittent Preventive Therapy (IPT_p) for the prevention of malaria in pregnancy for women aged 15 – 49 years in Uganda. An estimation of the uptake of the IPT_p using the characteristics of the women and the prediction of the expected uptake was also done. **Methods:** Using nationally representative, cross-sectional data from the third survey of malaria in Uganda, the Uganda Malaria Indicator Survey – 2018/19, data from 4,759 participants were analysed. A binary logistic regression model was used for examining the association between IPT_p uptake and the predictors that were divided into socioeconomic factors and maternal-related factors. **Results:** About 89% of the participants took at least a dose of IPT_p preceding the survey, on average the participants were aged 28.5 ($\pm$7) years, with a majority having attained a primary level of education (56.6%), and most women in the survey were from the rural parts of Uganda (71.9%). An additional child born by a woman and an additional antenatal visit was associated with an increase in the uptake of at least a dose of IPT_p by 0.5 and 3.8 percentage points respectively. Having a higher, secondary, and primary level education was associated with an increased uptake of at least a dose of IPT_p by 6.9, 3.9, and 2.9 percentage points as compared to not having a formal level of education. However, the study found no significant association between age, wealth index, and listening to radio messages about malaria with the uptake of IPT_p. **Conclusions:** With the presence of the "public health failure" due to the missed opportunity of having low uptake of more than a dose of IPTp despite high levels of antenatal attendances in Uganda, this dissertation adds to a body of knowledge on the predictors of IPT_p uptake and it also suggests possible interventions such as promotion of quality education to women, provision of more information concerning malaria causes and its prevention in pregnancy, use of peer mothers to educate women of reproductive age on issues concerning malaria in pregnancy and uptake of IPTp, and the use of longitudinal data to estimate the causal impact of the predictors of IPTp-SP.

1 Introduction

1.1 Malaria in pregnancy

Malaria is a parasitic infection that is normally transmitted by mosquito bites (Buh et al., 2019), caused by a plasmodium that is made up of protozoa (Vandy et al., 2019). Owusu-Boateng and Anto (2017) and Yaya et al. (2019) indicated that there are 5 different kinds of plasmodium that are responsible for causing malaria in humans; plasmodium falciparum, plasmodium malariae, plasmodium vivax, plasmodium ovale, and plasmodium knowlesi. Plasmodium vivax and falciparum cause the most global malaria cases in the world with specifically the latter causing the greatest harm on the African continent especially the Sub Saharan Africa region (Yaya et al., 2018), (Yaya et al., 2019), and (Okethwangu et al., 2019).

Numerous studies have indicated the global prevalence of malaria; Buh et al. (2019), Roman et al. (2019), and Anto et al. (2019) showed that, globally, malaria affected over 150 million individuals with 90 percent contribution to the disease burden league table coming from Africa. The burden of malaria is hard-hitting mostly pregnant women and children under 5 years Ibrahim et al. (2017), globally about 50 million malaria in pregnancy cases are indicated with at least one-half of the number coming from Africa (Mutulei, 2013), (Ibrahim et al., 2017), and (Fernandes et al., 2020b). The main reason why malaria mostly affects pregnant women and their infants is the reduced immunity of women during pregnancy, attributed to hormonal and immunological changes during pregnancy (Vandy et al., 2019) and (Rogerson, 2017).

In Uganda, though the prevalence of Malaria has greatly reduced by about 50 percent from 2014 since the WHO revision of the strategies meant to mitigate the surge of the disease in its member states to 9.1 percent in 2019. Malaria remains the highest cause of Morbidity in Uganda, with 34 percent of the outpatient, 24 percent of the in-patient admissions, and 12 percent deaths reported due to malaria; with children under 5 years contributing the highest death toll due to malaria by 67 percent (MoH, 2020). Odongo et al. (2015) and Mbonye et al. (2016) indicated that malaria in pregnancy (MiP) is of great public importance in Uganda; Uganda is amongst the seven African countries that contribute to about 53% of entire MiP cases in Africa out of the 90 percent cases contributed in entire Africa and this solely because of the high fertility rate of the women in Uganda and 95% of the entire geographical region of the country is susceptible to the highly endemic malaria plasmodium falciparum. Okethwangu et al. (2019) indicated that Uganda ranks at position four in the top countries with the highest malaria burden and transmission in the world.

MiP in Uganda is associated with negative outcomes on both the mothers and the neonates; such as anaemia in the mothers and low birth weight in the infants Mbonye et al. (2016), these factors

can lead to infant and maternal mortality (Nkoka et al., 2018). Globally, MiP claims about 10,000 mothers with about 100,000 infants (Nkoka et al., 2018), (Roman et al., 2019), (Doku et al., 2016) and (Adewole et al., 2019). Several factors are associated with MiP; Adewole et al. (2019) indicate that MiP is associated with an increased risk of having a stillbirth and miscarriage. Also, Saito et al. (2020) illustrate further by stating that regions that have high endemicity of malaria such as Africa have asymptomatic malaria and are normally affected by the plasmodium falciparum malaria have a chance of 3 to 4 times of having spontaneous abortions or miscarriages due to MiP with the Asian, western pacific, and Latin America region which is normally having the Plasmodium vivax malaria having a chance of up to 3 times of having stillbirths due to MiP. Arinaitwe et al. (2013) and Arnaldo et al. (2019) further explain that MiP is also associated with detrimental health outcomes such as intrauterine growth restrictions, preterm births, early deaths from neonates, and maternal mortality. MiP is also associated with congenital malaria (Arnaldo et al., 2019). MiP may also cause complications such as hypoglycaemia, foetal distress, and pulmonary oedema (Buh et al., 2019).

1.2 Prevention strategies

The WHO proposed three strategies that can be used to help prevent and fight malaria in moderate to high malaria-infested countries mostly in Sub Saharan Africa region; (i) using insecticide-treated bed nets, (ii) management of clinical malaria and anaemia, and (iii) use of intermittent preventive treatment in pregnancy (IPT_p) involving taking of sulfadoxine-pyrimethamine (SP) dose during the antenatal visits by the pregnant mothers (WHO, 2012). Sangaré et al. (2010) state that "IPT_p is estimated to reduce the occurrence of low birth weight by 42 percent, neonatal death by 38 percent, placental malaria by 65 percent, and antenatal parasitaemia by 26 percent". IPT_p-SP is to be administered to women at least four times starting with the early second trimester until delivery, it should not be given to HIV positive pregnant women that are taking cotrimoxazole and should not be given in the first trimester since there are studies that indicated toxicity to the foetus in the first trimester and toxicity caused by its reaction with cotrimoxazole for HIV positive pregnant mothers (Fernandes et al., 2020a), (Salman et al., 2020) and (Stephen et al., 2016). However, a lot of concern has been raised concerning the effectiveness of IPT_p-SP in the prevention of MiP in many Sub-Saharan African countries with indications in Uganda and other countries showing increased resistance by the plasmodium falciparum to IPT_P-SP (Fernandes et al., 2020b), (Saito et al., 2020), and (Kajubi et al., 2019).

In Uganda, IPT_p-SP is regarded as the main preventive therapy for MiP, with the use of quinine therapy in the first semester and some health facilities resorted to the use of artemisinin (ACT) therapies though not yet officially laid out as a

policy by WHO, it has shown effectiveness in the prevention of MiP (Wanzira et al., 2016).

1.3 Aims and Objectives

Though the malaria burden is declining in Uganda, a great number of infants and women are dying due to preventable and avoidable malaria deaths. The uptake of the second dosage of intermittent preventive therapy for pregnancy using sulfadoxine-pyrimethamine is still very low despite the high numbers of antenatal visits by pregnant women. From the Uganda Malaria Indicator Survey Report, about 41 percent of the women surveyed claimed they had received IPT_p third dose two years preceding the survey, this is still below the 80 percent target (Uganda National Malaria Control Division (NMCD), 2020). Limited literature is available on the determinants of the uptake of IPTp for the prevention of MiP in Uganda, therefore the main objective of the dissertation was to evaluate the determinants of the uptake of IPTp for the prevention of MiP in Uganda.

The primary objectives were:

- To examine the expected uptake of IPTp-SP in Uganda from the associated factors.
- To determine the factors associated with uptake of Intermittent Preventive Therapy in Uganda.
- To examine the uptake of IPT_p-SP by participant's characteristics in Uganda.

1.4 Structure

In what follows, the second chapter provides the reader with an extensive overview of literature enabling the reader to grasp the risk factors associated with MiP, the prevalence of MiP in the world, and the treatment and prevention of MiP not forgetting factors associated with intermittent preventive therapy in other parts of the world. The final part of the literature will focus on the uptake of IPT_p in Uganda and several benefits and negative effects associated with IPT_p-SP. In the subsequent chapter – chapter three, we begin with data and methods, variables used in the thesis, and analysis, then we introduce the fourth chapter focusing on the findings of the study. In the next chapter – chapter five, we discuss the results in detail while relating them to the existing literature which is then followed by a discussion on the thesis limitations, policy implications, and future research. The conclusion of this dissertation will entail the basis of chapter six.

2 Literature review

The purpose of this literature review is to provide the reader with an across-the-board overview of the causes, diagnosis, and prevalence of MiP in the world, the consequences associated with MiP, and the treatment and prevention of MiP not forgetting factors associated with IPT_p in other parts of the world. The final part of the literature will focus on the uptake of IPTp in Uganda and several benefits and negative effects associated with IPTp-SP.

2.1 Overview of Malaria in Pregnancy

2.1.1 Causes

Owusu-Boateng and Anto (2017) define malaria as "a life-threatening disease that is caused by a different genus of plasmodium and transmitted through bites of the female anopheles' mosquitoes". As noted previously from the 5 plasmodia that cause malaria, plasmodium vivax and falciparum cause the most global malaria cases in the world with specifically the latter causing the greatest harm on the African continent especially the Sub Saharan Africa region (Owusu-Boateng and Anto, 2017), (Yaya et al., 2018), (Yaya et al., 2019), and (Okethwangu et al., 2019).

Desai et al. (2007) stated that "so long as a woman has walked the earth, malaria may have stalked her". Malaria is a complex public threat since it mostly affects children under 5 years and pregnant women (Anto et al., 2019). The main reason why pregnant women are likely to suffer from malaria during pregnancy is because of the reduction in their immunity, with the plasmodium parasite normally making the placenta have malaria parasite (placenta malaria) that cannot be cleared by immunity. This is because the parasite will sequester in the blood spaces of the maternal placenta by sticking on the placental receptor – Chondroitin Sulphate A (CSA) (Rogerson, 2017), (Steketee et al., 2001), and (Yaya et al., 2018).

2.1.2 Diagnosis

The diagnosis of MiP can be done using either microscopy; where a blood smear is obtained from a pregnant woman and then the presence of the malaria parasite detected using a microscope or using a rapid diagnostic test (RDT), though RDTs cannot easily determine the presence of low-density malaria parasite. The best way to detect the presence of malaria parasites would be through the use of polymerase chain receptor test (PCR) which can only be used by competent and trained staff to even detect malaria when it is at a low density (Rogerson, 2017).

2.1.3 Prevalence

Approximately one in four women in Africa during the time of delivery are associated with having placental malaria (Desai et al., 2007) and (Vandy et al., 2019). Globally, about 125 million women are at risk of having MiP (Buh et al., 2019). It is also indicated that more than 30 million women are at risk of having MiP that is caused by the plasmodium falciparum especially in Sub-Saharan Africa (Ibrahim et al., 2017), (Akpa et al., 2019),

(Maheu-Giroux and Castro, 2014), and (Briand et al., 2007). About 14 percent of the outpatient visits, 11 percent of the inpatient admissions, and the deaths either maternal or neonatal are attributed due to the presence of MiP in Ghana (Ibrahim et al., 2017). Desai et al. (2007) indicated that the median amount of MiP that was obtained from 20 studies in about eight countries from 1985 to 2000 was about 27 percent. This was followed by other related results from a study that was carried out in about 11 countries around 1980 which indicated that median MiP specifically placenta malaria was about 26 percent (Desai et al., 2007). In Uganda, about 90 percent of the entire geographical locations of the country are affected by high intensity of malaria with high levels of transmission with the rest living in low transmission areas that are highly susceptible to malaria epidemics (Odongo et al., 2015) and (Kiwuwa and Mufubenga, 2008). Another study reported by Kiwuwa and Mufubenga (2008) indicated that about 62 percent of MiP cases that were detected during that time in Uganda had malaria parasitaemia. In Malawi between 2009 and 2014, the prevalence of MiP was reported to be about 19 percent among women that were attending their first antenatal visit (Nkoka et al., 2018). Okethwangu et al. (2019) stated that in Uganda and from the malaria indicator survey 2009, "malaria parasitaemia was highest in most regions of the country, with hyper-endemicity (prevalence of 50-75%) demonstrated in three regions, meso-endemicity (prevalence of 10-50%) in six, and hypo-endemicity (prevalence <10%) in one region".

2.2 Consequences

Steketee et al. (2001) indicated the plasmodium falciparum responsible for MiP and which is normally found in the vascular space of the placenta is responsible for maternal anaemia, low birth weight which is normally attributed to prematurity of the infants, and inter uterine growth retardation. In Tanzania, the prevalence of anaemia in pregnant women is 40 percent which is higher than the global average of 38.2 percent; Mikomangwa et al. (2019) reported that MiP is one of the contributors to anaemia in pregnant women. Also, MiP accounts for about 10,000 maternal deaths and more than 100,000 infant mortalities in the Sub Saharan African region (Akpa et al., 2019) and (Nkoka et al., 2018). Saito et al. (2020) indicated that in 2015, there were about 300,000 maternal deaths attributed to Malaria with 99 percent of the cases attributed to low-income and middle-income countries of which Uganda and most countries in Sub-Saharan Africa are inclusive.

Also, Ibrahim et al. (2017) alluded to the fact that stillbirths with rare cases of congenital malaria are a result of MiP. Things further escalate economically when it comes to the treatment of each episode of malaria in Malawi, with the estimated economic burden of treating each episode of malaria from Malawi a developing country estimated to be USD 17.48 (Nkoka et al., 2018).

Malaria in pregnancy is also associated with adverse outcomes on the mothers such as maternal hypoglycaemia, miscarriage (spontaneous abortion), and preterm birth (Roh et al., 2020), (Yaya et al., 2018), and (Anto et al., 2019). In Sub-Saharan Africa, the plasmodium falciparum is associated with about 200,000 stillbirths per year (Saito et al., 2020).

Kiwuwa and Mufubenga (2008) stated that "the consequences related to malaria in pregnancy are believed to be responsible for some of the women's emotional stress, stigma, superstition, self-hatred, indulgence, divorce, and ostracization in the society."

SES gradient affects health, the impacts might be long time impacts, Bhattacharya et al. (2014) indicate that early deprivation in life such as MiP which would deprive better life for the foetus might affect the health outcomes of such individuals during their lifetime; this is termed as the thrifty phenotype hypothesis used as a Grossman model explanation for why SES affect health. Also, Desai et al. (2007) stated that one study in Malawi indicated an association of MiP that causes low birth weight in infants is associated with premature growth and in the long run related to short stature in adolescence and adulthood. This study indicates that MiP may have long-term impacts on the health outcomes of infants. Also, Lleras-Muney (2018) associates her report with that of Marmot (2017) in support of early childhood interventions since they would have a lot of impact on the health outcomes of the infants in the future.

2.3 Prevention

Strategies for the prevention of malaria especially in Africa started to be put into practice around the 1950s; these strategies involved the use of chemoprophylaxis with chloroquine in regions of West Africa with dapsone-pyrimethamine used in East African countries. These strategies demonstrated efficacy in the mitigating effects of low birth weight, maternal anaemia, and placental malaria, however, due to increased resistance of the drugs and the side effects that came with the use of the drugs, a proposal to set up a new treatment and prevention strategy was established around 1998 and then implemented in 2004 (Briand et al., 2007). The World Health Organisation came up with a three-pronged strategy for the prevention and treatment of MiP, these strategies include (i) appropriate case management of malaria, (ii) sleeping under insecticide-treated mosquito nets (ITN), and (iii) intermittent preventive therapy with Sulfadoxine-pyrimethamine for malaria in pregnancy (Kiwuwa and Mufubenga, 2008), (WHO, 2012), (Vandy et al., 2019) and (Okethwangu et al., 2019). These key strategies are explained in the subsequent sections with more emphasis put on the IPT_p.

2.3.1 Insecticide Treated Nets

There is a large amount of evidence from Africa indicating the effectiveness of ITN in the prevention of MiP with its adverse health outcomes such as low birth weight. This is normally accompanied by the use of indoor residual spraying with little or no data showing how indoor residual spraying has mitigated the effect of malaria in pregnancy. Also, Rogerson (2017) explains that there is a scarcity of data from Asia concerning the effects of ITNs possibly because of the difference in the bites of the mosquitoes, with the most predominant cause of malaria coming from plasmodium vivax.

2.3.2 Treatment

The recommended treatment of malaria in pregnancy during the first trimester is quinine (QNN) and clindamycin, QNN is a seven-day dose treatment that is effective in the treatment of malaria in pregnancy cases, side effects involving fullness of the ear and a lot of days involved for completion of the dosage have made it difficult for pregnant women to adhere to the treatment (Rogerson, 2017). Also, another alternative to quinine during the first trimester is artemisinin-based combination therapy (ACT), studies involving ACT and quinine indicated that there is a reduced risk for a pregnant mother in having stillbirths when using ACTs as compared to quinine. This milestone led to the approval of ACTs by the WHO as a treatment for malaria in pregnancy in the first trimester. However, there is a study from the animals using ACTs that indicated embryotoxicity, hence making it a challenge for WHO to officially recommend the inclusion of ACTs in the treatment guidelines (Rogerson, 2017).

Lastly, several treatment regimens have been recommended for the treatment of MiP during the second and third trimesters; artemether-lumefantrine, amodiaquine-artesunate, mefloquine-artesunate, and dihydroartemisinin-piperaquine (DHA-PQ). ACTs are the recommended first-line treatment for MiP in Africa and amongst the WHO member states since they showed about 95 percent effectiveness with little adverse effects. Other first-line treatments for MiP in Asia most especially in countries affected by the plasmodium vivax species, the plasmodium had become resistant to them, though the introduction of DHA-PQ better health outcomes associated with a decline in maternal anaemia, increase in birth weight, and reduction in congenital malaria in women and the neonates (Rogerson, 2017).

2.3.3 Intermittent Preventive Therapy (IPT_P)

As previously mentioned, WHO members states address the problem of MiP with three (3) approaches, key amongst them is the use of intermittent preventive therapy using sulfadoxine-pyrimethamine (Brentlinger et al., 2007). Intermittent Preventive Therapy is given basing on an assumption that all pregnant women in areas of moderate to high transmission have malaria parasites in their placenta or blood regardless of

whether they have malaria symptoms or not (Ibrahim et al., 2017).

IPT_p was first recommended to be administered at least two times starting as early in the second trimester during antenatal visits under direct observation (DOT) by a qualified health provider. However, in 2012 there was a revision for the recommended number of doses a pregnant woman should receive by WHO, at least three doses should be administered at any visit starting in the second trimester (Briand et al., 2007) and (Ibrahim et al., 2017).

It is not allowed to administer IPT_p in the first trimester of the pregnancy as studies have shown issues related to embryotoxicity in animals regarded use of IPT during the early months of pregnancy. Also, HIV-positive pregnant women who are on cotrimoxazole therapy are not supposed to take IPT_p since the reaction between the two causes toxicity in the human body (Gutman and Slutsker, 2017).

There are numerous benefits indicated for using IPT_p for the prevention of MiP; Gutman and Slutsker (2017) indicated that IPT_p-SP helps in the improvement of birth weight of the neonates mostly because of the presence of the antibacterial component in the therapy. IPT_p is also associated with a reduction in placenta malaria and anaemia during pregnancy (Balami et al., 2020).

Unfortunately, the coverage of IPT_p is still low with the positive benefits indicated with the use of IPT_p in mostly Sub-Saharan Africa region. In every antenatal visit after the first trimester, women are expected to have at least 3 doses of IPT_p-SP up to the point of delivery, and the WHO revised the target of IPT_p second dose coverage to 80 percent from 60 percent in 2012 (WHO, 2012).

Countries using the IPT_p still find a challenge hitting the 80 percent global target; Vandy et al. (2019) indicated that about 69 percent of the pregnant women in Sub-Saharan Africa did not have access to IPT_p. From the reports of about 33 countries including Uganda and Nigeria in 2018, only 22 percent of the pregnant women eligible for IPT_p received at least 2 doses. Also, in Nigeria, the proportion of women who received at least one dose of IPT_p in 2018 was about 63 percent, this was still way below the recommended 80 percent target (Akpa et al., 2019). In 2016, from about 23 African countries, the percentage of eligible women that received three (3) or more doses of IPT_p was 19 as compared to 18 and 13 percent in 2015 and 2014 respectively, this shows a problem in the uptake of IPT_p (Yaya et al., 2019). Dating back to 2009 and 2010, despite a high number of women that attended at least two (2) antenatal visits – 75 percent to be specific, only 22 percent had at least two (2) doses of IPT_p, this indicates a "failure in public health" as stated by (Maheu-Giroux and Castro, 2014).

With the worrying coverage figures of IPT_p, there is also a growing resistance to sulfadoxine-pyrimethamine therapy by the malaria parasite in

Sub Saharan Africa, this has led to the discoveries of other therapies such as dihydroartemisinin-pyrimethamine to be used during pregnancy though not yet officially recommended by WHO (Roh et al., 2020).

With the bothersome uptake of IPT_p-SP and growing resistance of the sulfadoxine-pyrimethamine therapy by the parasite, there is a need to investigate the factors associated with the uptake of IPT. The next section will focus on the elaboration of some of the factors associated with the IPT_p uptake globally.

2.3.3.1 Factors associated with IPT_P uptake

Yaya et al. (2018) narrated that limited and poor awareness of MiP and its prevention measures, the stock out of IPT_p-SP which is usually free in most public health facilities, and the delay of women to attend antenatal care since IPT_p is given during antenatal visits as some of the factors influencing the IPT_p uptake. This is also experienced in Senegal where Mutulei (2013) asserts that the timing of IPT_p is associated with the number of ANC visits.

There is also an association between socio-demographic factors such as maternal age, level of education, employment, and place of residence with the uptake of IPT_p (Balami et al., 2020), (Nkoka et al., 2018), and (Doku et al., 2016). Balami et al. (2020) indicated that gravidity is associated with the uptake of IPT_p, first-time pregnant women – primigravidae; tend to have a higher uptake of IPT_p than the second time and other multigravidas' women. Mutulei (2013) indicated that in Kenya, being married was associated with the uptake of IPT_p. Although, in Tanzania, different results were found, as personal factors such as age, marital status, and the level of education were not associated with the level of uptake of IPT_p.

Distance from the health facility, absence of health complications during pregnancy, and amount of domestic work done by the pregnant women were also associated with the uptake of IPT_p (Mutulei, 2013).

With the above preamble, there is a need to focus on the IPT_p coverage of Uganda as indicated in the next section.

2.4 IPT_p uptake in Uganda

The trend of IPT_p uptake has not been good in the past financial years despite malaria being the highest cause of morbidity and mortality in Uganda. Figure 1 below extracted from data in the MoH (2020) report indicates that the country still lags in terms of achieving the 80 percent target of IPT_p second dose coverage.

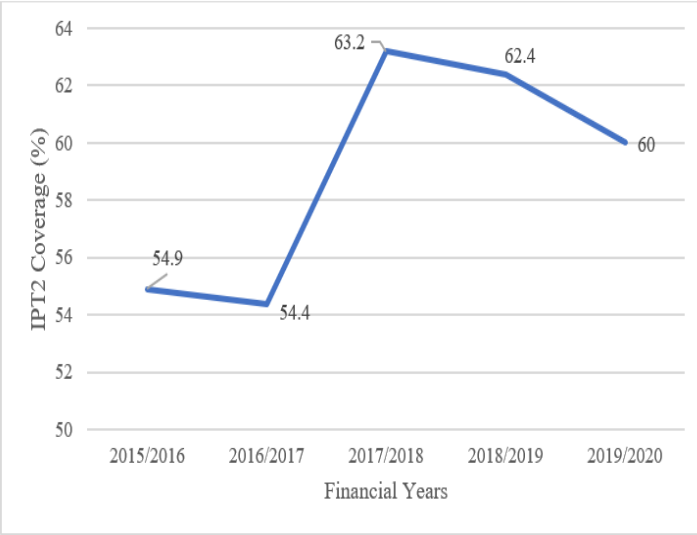


Figure 1: Trend of IPT2 Coverage in Uganda for the past 5 financial years. Source: MoH, 2020

From the financial year 2015/16 to date, Uganda has only improved by about 5 percentage points in terms of its second dose IPT2 coverage, that is 54.9 percent to 60 percent in 2019/2020. The policy guideline on the attendance of ANC in Uganda indicates that women should attend ANC at least 4 times with recent directions showing up to 8 times during pregnancy and at least three doses of IPT_p taken during the visits starting in the second trimester, though the coverage of IPT_p is still under the 80 percent target (Okethwangu et al., 2019).

In 2007 – 2008, about 37 percent of the eligible women received at least one dose of IPT_p with only 18 percent receiving two or more doses of IPT_p (Sangaré et al., 2010).

Several factors are associated with the uptake of IPT_p in Uganda, knowledge of IPT_p, level of education as explained by Mutulei (2013) that women with no primary education were associated with lower IPT_p uptake in Uganda. The resistance of the parasite to the current IPT_p regimen is also another factor affecting the uptake as indicated by (Fernandes et al., 2020a). It is also reported that the timing of the ANC visit has no association with the uptake of IPT_p in Uganda (Nkoka et al., 2018). Other reports such as the one by Sangaré et al. (2010) show a lack of association between the number of ANC visits, the wealth of a household, and travel times to ANC clinics in Uganda.

2.5 Summary

This chapter has reviewed existing evidence surrounding the causes, diagnosis, and consequences of MiP, with the prevalence of MiP globally and Uganda, the prevention of malaria with most emphasis on IPT_p, and the factors associated with intermittent preventive therapy in other parts of the world and Uganda. Some studies in Uganda have analysed various factors that are associated with the uptake of IPT_p though with varying results, I intend to do the analysis with recent data and relate it with the findings of the previous studies in Uganda. The following chapter outlines the methodology behind the analysis to examine the prevalence and determinants of the uptake of Intermittent Preventive Therapy (IPTp) for the prevention of MiP in Uganda.

3 Data and methods

This chapter shades light on the data used for analysis, and the methods employed in carrying out the analysis. To start with, a brief explanation of the data set used in the entire dissertation is provided – The Uganda Malaria Indicator Survey, (UMIS). Secondly, a thorough description of the dependent variable and various independent variables used is provided. Lastly, the various methodological approaches adopted to examine the research questions of interest are described.

3.1 Data

In the dissertation, we use data from the 2018-2019 Uganda Malaria Indicator Survey (UMIS); which is a survey that is conducted every five years since 2009, the first cross-sectional data collection was done in 2009, followed by 2014, and the current data being used for analysis was collected towards the end of 2018. This survey was implemented by the National Malaria Control Division (NMCD) and Uganda Bureau of Statistics (UBOS) with the main objective of the collection of the data being provision of up-to-date estimates that can be used for estimates of demographic and health indicators that are associated with malaria (Uganda National Malaria Control Division (NMCD), 2020).

UMIS data normally consists of components such as intermittent prevention of malaria in pregnancy, vector control interventions such as mosquito nets and use of indoor residual spraying of insecticides, care-seeking and treatment of fever in children, and malaria knowledge, behaviour, and practices among the respondents chosen from a representative sample using the sampling frame from the national population census conducted by the Uganda Bureau of statistics (Uganda Bureau of Statistics - UBOS and ICF, 2018). The data used in the analysis is for women aged 15 – 49 years and it is an extract from the 5 databases that were generated from the UMIS that was administered between 11 December 2018 and 31 January 2019.

Through the financial support of the United States Agency for International Development (USAID), the United Kingdom Department for International Development (DFID), and the Government of Uganda with support from the Global Fund, data was collected through technical assistance by Inner City Fund (ICF) in Rockville, Maryland, USA an institution responsible for Demographic Health Survey Data Collection in many countries. The data was collected by 96 trained fieldworkers who were trained by TOTs from the NMCD, UBOS, and ICF from 20th November 2018 to 8th December 2018. The interviewers collected data using computer-aided personal interviewing (CAPI) and the information was transferred from the tablets to the server of UBOS via a secure internet file streaming system (IFSS). From the targeted 8,389 women that were eligible for the interview, about 98% of the women were successfully interviewed (Uganda National Malaria Control Division (NMCD), 2020).

3.2 Dependent Variable

The main dependent variable of interest is a binary variable which indicates if a woman during pregnancy took IPT_p-SP or what is commonly known as "Fansidar", and it takes on a value of 1 if a woman took Fansidar or 0 if the woman did not take Fansidar during pregnancy.

3.3 Independent Variables

There are very many factors indicated in the literature that are associated with the uptake of Intermittent Preventive Therapy (IPT_p-SP) during pregnancy but not limited to; level of education, income level, place of residence, media, region, age, number of ANC visits during pregnancy, and parity. Below is an explanation of the factors that have been selected based on the previous studies, all of which have been controlled for in a multivariate analysis.

Some independent variables have been categorized under the sociodemographic variables bracket as indicated by the literature. Level of education (Educ), is an ordered variable with categories running from no education, primary, secondary, and tertiary for the highest level of education. Wealth index as explained in the survey report of Uganda National Malaria Control Division (NMCD) (2020) "the households are given scores based on the number and the kind of consumer goods they own, ranging from a television to a bicycle or a car, and housing characteristics such as the source of drinking water, toilet facilities, and flooring materials. These scores were derived using component analysis. The National wealth quintiles are compiled by assigning the household score to each usual household member, then ranking each person in the household population by the score, and then dividing the distribution into five equal categories." These five quintiles include; lowest, second, middle, fourth, and highest wealth index. Place of residence is a binary variable with 0 for "urban" and 1 for "rural". Household has a radio is also a variable with 0 for "No" and 1 for "Yes". Other control variables that were used, categorized as maternal-related conditions; age, which represents the age of women with an assumption that the date of birth is the 1st of the specified month. The age of the respondents in the survey ranged from 15 – 49 years. The number of antenatal visits, represents the number of visits made by the women during pregnancy to the respective health facilities, and the last variable that was used in the study is the total number of children ever born by the woman (parity), this is a count variable. The selection of these variables that have an association with the uptake of IPT_p-SP involved the review of the existing literature and the availability of the suitable variables in the UMIS data set.

3.3 Data analysis

Data analysis was conducted upon the completion of data cleaning and was analysed using Stata (Version 16.1). Missing values and those who stated that they did not know for each variable were excluded from the analysis. The empirical

approaches used in the analysis are described in the next section. Firstly, the logit specification is described, followed by the binary logit model specification.

3.3.1 Logit model specification

The decision by a woman i to take IPT$_p$-SP (A_i) is modelled as a function of a vector of Socioeconomic variables (X^s) and a vector of maternal related factors (X^p), such that:

$$A_i = f(X^s, X^p, \eta_i) \qquad \text{(Equation 1)}$$

A_i is a binary variable taking a value of 1 if the woman took Fansidar (IPT$_p$-SP) and a value of 0 otherwise and η_i is a stochastic error term. The variables included in the vector X^s include indicator variables – level of education, wealth index, place of residence, and possession of radio acting as a proxy variable for listening to information on malaria. The variables included in X^p include age, number of antenatal visits, and parity.

Given the binary nature of the dependent variable, a logit model was estimated where the probability of a woman i taking IPT$_p$-SP is defined as $P_i = P(A_i = 1)$.

Under the assumptions of the model, $P_i = \Lambda(X'\beta)$ where $\Lambda(.)$ represents the logistic cumulative distribution function (i.e., $\Lambda(X'\beta) = (e^{X'\beta}/(1 + e^{X'\beta}))$, β is a vector of parameters and the vector X includes X^s and X^p. Estimation provides $\hat{\beta}$, unbiased estimates of the model coefficients β and it can easily be shown that

$$\ln\left(\frac{p}{1-p}\right) = \text{logit}(P) = X'\beta \qquad \text{(Equation 2)}$$

so that the estimated probability of taking IPT$_p$-SP, $\widehat{P_i}$, can be estimated for each woman using $\hat{\beta}$ and appropriate values of X. We adopt a kind of model specification indicated by (Cullinan et al., 2012).

3.4 Summary

Using nationally representative, cross-sectional data from the third survey of the Uganda Malaria Indicator Survey – 2018/2019 (UMIS – 2018/2019), a logit regression was used to investigate the association between a range of independent variables and uptake of Intermittent Preventive Therapy (IPT$_p$-SP). The next section describes the findings of the analysis done.

4 Results

This chapter presents the empirical results from the various analyses carried out. First, descriptive statistics from the estimation sample are presented. Also, univariate analyses are done to examine the distribution of IPT_p-SP by participants' characteristics, and series of multivariate models are then used to identify predictors of IPT_p uptake for women aged 15 – 49 years in Uganda.

4.1 Descriptive statistics

Table 1 presents sample descriptive statistics for several other variables in a sample of 4,759 participants considered in the analysis.

Table 1: Variable definitions and sample descriptive statistics, n = 4,759

Variable	Definition	% or Mean (SD)
	Dependent Variable	
Took IPT_p-SP during pregnancy	= 0 if did not take IPT_p-SP during pregnancy	10.61
	= 1 if took IPT_p-SP during pregnancy	89.39
	Independent Variables – SES	
Highest level of education (Educ)	= 0 if no education	19.86
	= 1 if primary education	56.63
	= 2 if secondary education	19.14
	= 3 if higher education level	4.37
Wealth Index	= 1 if poorest in the wealth index	33.77
	= 2 if poorer in wealth index	21.98
	= 3 if middle in the wealth index	15.99
	= 4 if richer in the wealth index	13.62
	= 5 if richest in wealth index	14.65
Place of residence	= 1 if urban	28.09
	= 2 if rural	71.91
Possession of a radio	= 0 if no radio	51.38
	= 1 if there is a radio	48.62
	Maternal related independent variables	
Antenatal visits	= Number of antenatal visits during pregnancy	3.68 (1.42)
Parity	= total number of children ever born	3.96 (2.61)
age	= Age of the women	28.50 (7.03)

Source: Analysis of the Uganda Malaria Indicator Survey, women's database.
SES, Socioeconomic Status; IPT_p-SP, Intermittent Preventive Therapy using sulfadoxine - pyrimethamine

89.39 percent of the women had taken at least a dose of IPT_p-SP preceding the survey, out of the 4,759 women that had either received or not received at least a dose of IPT_p-SP during pregnancy; the majority belonged to the lowest quintile of wealth index (33.77%) with the lowest number of women belonging to the second-best quintile of the wealth index (13.62%). Also, Table 1 indicates that the majority of the women who were surveyed had attained at least a primary level of education (80.14%) with those that had attained only a primary level of education (56.63%) and about 4% with the highest level of education. 71.91% of the women reside in rural areas, with a

majority of them not having a radio in their households (51.38%). On average, the total number of children ever born by the surveyed women was 3.96, with the average number of antenatal visits being around 3.68 visits, and the average age of the women in the sample was 28.50 years.

4.2 Uptake of IPTp-SP by participant's characteristics in Uganda; Univariate analysis.

Univariate analysis was carried out to examine the differences between women who received at least one dose of IPT_p-SP with those who did not receive any dose. These variations are indicated in Table 2 below.

Table 2: Univariate analysis of participant's characteristics on uptake of IPT_p

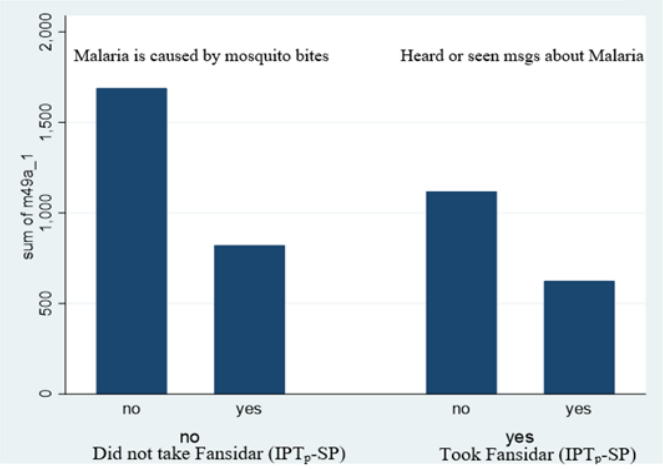
Variable	Pearson χ^2	P Value
Highest level of education	20.3450	0.000***
Wealth Index	10.9846	0.027**
Place of residence	0.8638	0.353
Possession of a radio	2.1441	0.143
Age	38.3497	0.279
Antenatal visits	443.0878	0.000***
Parity	12.1867	0.665

Notes: The dependent variable (IPT_p-SP) is a binary variable taking 1 if the woman took IPT_p-SP during pregnancy and value of 0 otherwise. Univariate analysis done and the table reports Pearson's chi-square value and the p values. *** denotes significant at 1%, ** denotes significant at 5%, and * denotes significant at 10%.

There was a significant variation in the level of education attained between the women who had taken at least a dose of IPT_p-SP with those who had not taken any IPT_p-SP during pregnancy ($p < 0.01$). Also, variations were seen in terms of the wealth index of the recipients of IPT_p-SP and those who did not receive ($p<0.05$). In terms of risk factors associated with IPT_p-SP, there was variation between the two groups concerning the number of antenatal visits at a 1% level of significance. Interestingly, there were no variations indicated between the groups that received IPT_p-SP and those that did not in terms of place of residence; rural and urban, exposure to radio messages about Malaria, age, and the number of children ever born by the women.

Further graphical analysis shows variation concerning the knowledge about the causes of malaria. Figures 2 and 3 below describe the variations in terms of the knowledge about malaria causes. Figure 2 indicated that, from the women who did not take any Fansidar dose, a sizeable number of them; about 1,700 knew malaria was not caused by mosquito bites.

Figure 2: Graph showing knowledge about causes of Malaria

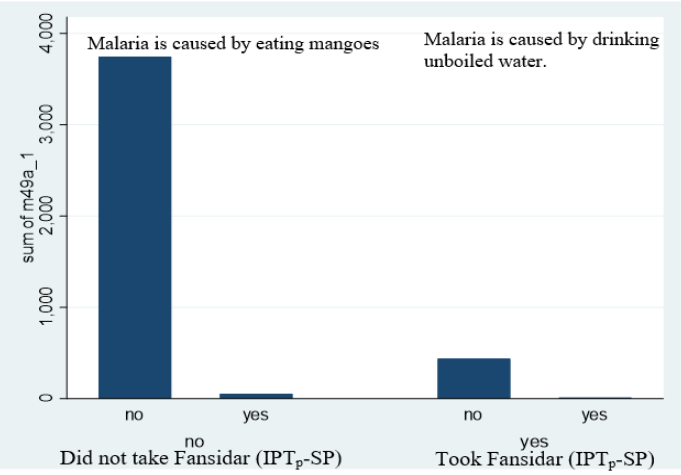


Source: Analysis of the Uganda Malaria Indicator Survey, women's database. IPT_p-SP, Intermittent Preventive Therapy using Sulfadoxine-pyrimethamine (Fansidar)

A high percentage of women who had received at least a dose of IPT_p-SP (about 1,050) did not hear or see any messages related to malaria and its prevention on media. Also, from Figure 3, there was a small percentage of women who did not take the

preventive therapy for malaria in pregnancy who believed that eating raw mangoes especially caused malaria.

Figure 3: Graph showing knowledge about causes of Malaria



Source: Analysis of the Uganda Malaria Indicator Survey, women's database. IPT_p-SP, Intermittent Preventive Therapy using Sulfadoxine-pyrimethamine (Fansidar)

Also, from those that took the preventive therapy for malaria in pregnancy, a small number of them believed that drinking unboiled water caused malaria as indicated in Figure 3 above.

4.3 Factors associated with uptake of IPTp-SP in Uganda; Multivariate analysis.

All variables used in the analysis of the univariate models were included in the multivariable regression analysis as covariates, and multivariable logistic regression models of the association between IPT_p-SP with other factors divided into socioeconomic (education level, wealth index, possession of a radio, and type of residence) and maternal related factors (age, number of ANC visits, and parity) was conducted. The findings of these models presented in Table 3 are expressed as probabilities (marginal effects). The overall model significance was evaluated using the likelihood ratio tests; the likelihood ratio test was used to test whether the final model was a good specification using an assumption of model 2 (m1) being nested in the final model; model 3 (m2).

Table 3: Estimated marginal effects of IPT_p-SP uptake

Variable	Marginal Effects	95% CI
Primary Educ	0.0269 (2.17) **	0.0014 to 0.0525
Secondary Educ	0.0392 (2.32) **	0.0064 to 0.0721
Higher Educ	0.0688 (2.52) **	0.0255 to 0.1120
Poorer wealth index	0.0161 (1.32)	-0.0075 to 0.0398
Middle wealth index	-0.0123 (0.82)	-0.0423 to 0.0176
Richer wealth index	0.0215 (1.37)	-0.0082 to 0.0512
Richest wealth index	-0.0012 (0.06)	-0.0382 to 0.0358
Rural	0.0012 (0.10)	-0.0207 to 0.0230
Yes, to having a radio	-0.0005 (0.05)	-0.0202 to 0.0193
Age	-0.0010 (1.04)	-0.0029 to 0.0009
Number of ANC visits	0.0381 (11.99) ***	0.0318 to 0.0444
Parity	0.0051 (1.86) *	-0.0003 to 0.0105
Statistics		
Observations used.	4,759	
Lrtest χ^2	152.56	
Prob > χ^2	0.0000	

Notes: The dependent variable (IPT_p-SP) is a binary variable taking 1 if the woman took IPT_p-SP during pregnancy and value of 0 otherwise. The binary logit model is estimated and the table reports marginal effects. Absolute values of z statistics are presented in parentheses. *** denotes significant at 1%, ** denotes significant at 5%, and * denotes significant at 10%.

Generally, the results from the preferred model indicate that after controlling for all the different factors, the probability of a woman with a primary level of education taking at least one dose of IPT_p during pregnancy is 2.7 percentage points higher than a woman without any level of formal education. Also, Table 3 showed that the probabilities of taking at least a dose of IPT_p for women with a secondary and higher level of education were 3.9 and 6.9 percentage points higher than that of women with no formal level of education respectively.

There is no difference in the probabilities for women who had at least a dose of IPT_p and those

who did not have in terms of differences in their wealth indices, type of residence, listening to malaria messages on radio, and age. This was indicated in Table 3 by the marginal effect not being statistically significant at a 10% level of significance.

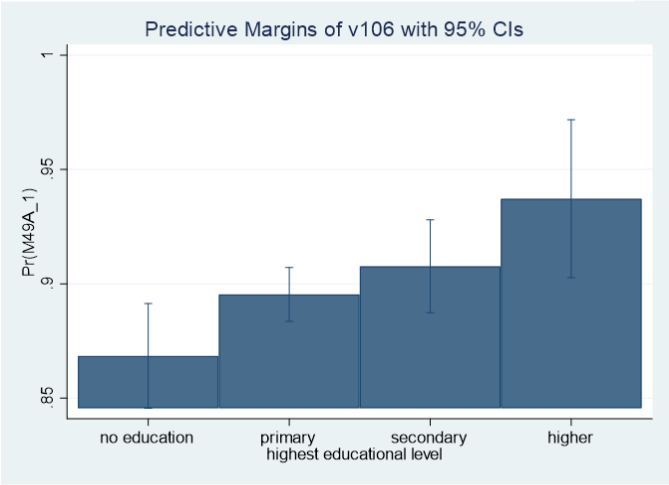
From the maternal-related risk factors, the results suggest that there is a positive association between the number of antenatal visits and the uptake of at least a dose of IPT_p during pregnancy. An additional antenatal visit was associated with a higher probability of taking at least a dose of IPT_p of 3.8 percentage points. Also, from Table 3, there is a positive relationship between the number of children ever born by a woman (parity) and the uptake of IPT_p. An additional child born by a woman is associated with having a higher probability of taking at least one dose of IPT_p by 0.5 percentage points and this was practically and statistically significant at a 10% level of significance.

4.4 Prediction for the expected uptake of IPTp-SP in Uganda.

The predicted expected probabilities as indicated in Figures 4, 5, and 6 respectively are strictly for the factors that were significantly and practically associated with the uptake of at least one dose of IPT_p-SP.

There was a generally positive relationship between the ordered level of education with the uptake of IPT_p. Women with higher levels of education are predicted to have a higher probability for the uptake of at least one dose of IPT_p of 0.937.

Figure 4: Graph showing predicted probabilities for IPT_p-SP uptake using education level

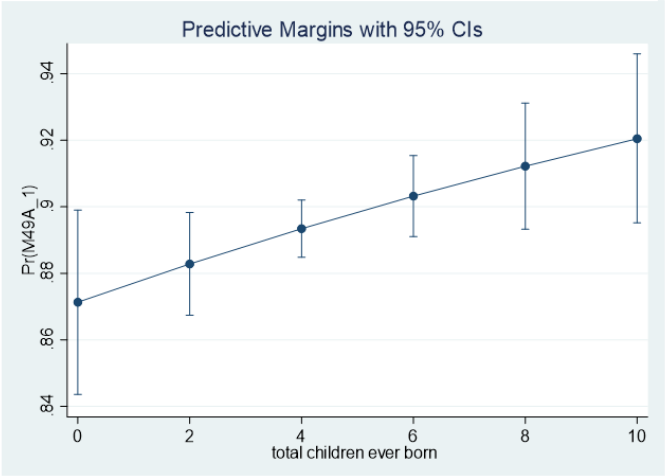


Source: Analysis of the Uganda Malaria Indicator Survey, women's database.

Also, Figure 4 indicated that women with no formal education will have a probability of about 0.868 for the uptake of at least a dose of IPT_p.

Women that have ever produced about 10 children had the highest predicted probability of taking at least a dose of IPT_p as indicated in Figure 5.

Figure 5: Graph showing predicted probabilities for IPT_p-SP uptake using parity

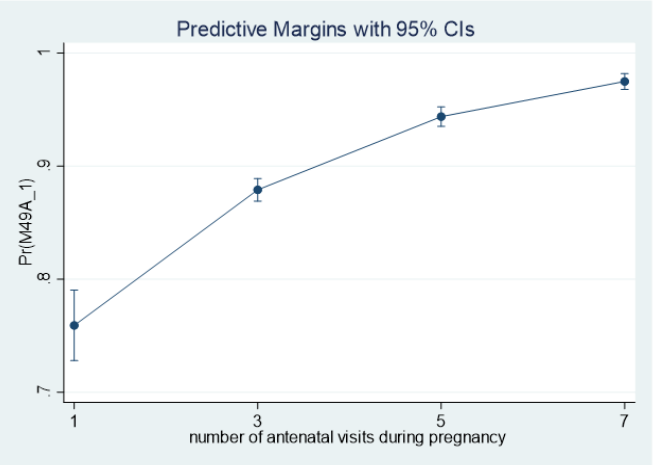


Source: Analysis of the Uganda Malaria Indicator Survey, women's database.

The predicted probability for taking at least a dose of IPT_p was 0.920, 0.903, 0.883, and 0.871 for women that had 10, 6, 2, and no children respectively.

Lastly, an increase in the number of antenatal visits is predicted to associate with a higher probability of uptake of at least a dose of IPT_p. Figure 6 showed that women with about 7 antenatal visits had a probability of about 0.975 of having at least a dose of IPT_p.

Figure 6: Graph showing predicted probabilities for IPT_p-SP uptake using number of antenatal visits



Source: Analysis of the Uganda Malaria Indicator Survey, women's database.

The women that attended only one antenatal visit had a probability of 0.759 of taking at least a dose of IPT_p during pregnancy.

4.5 Summary

Generally, the results from the study provide an insight into the determinants of the uptake of IPT_p-SP in Uganda, the distribution of the predictors of IPT_p in Uganda, and a prediction of the expected uptake of IPT_p basing on the most important determinants of the uptake of at least a dose of IPT_p-SP in Uganda. Having a higher level of education, higher antenatal visits, and more children ever born by the women were found to be statistically significantly associated with the uptake of at least a dose of IPT_p. The following chapter will discuss the above findings in more detail and compare and contrast these findings to existing literature.

5 Discussion.

This chapter discusses the findings of the thesis to the stated objectives of the dissertation as indicated in section 1.2. These findings are interpreted in light of the current knowledge described in the literature. Also, limitations associated with the analysis and thesis implications are discussed and recommendations for further research are made.

5.1 Objectives

Several studies have indicated various predictors of the uptake of Intermittent Preventive Therapy globally including in Uganda, varying results have been indicated from the studies concerning the association of the determinants with the uptake. This thesis uses current data from the Malaria Indicator Survey to examine the determinants of the uptake of IPT_p-SP in Uganda especially and relate the findings to the existing literature in Uganda and other countries.

5.2 Findings

The results indicated a positive association between the level of education and the uptake of IPT_p in Uganda. These findings were related to what Okethwangu et al. (2019) and Kiwuwa and Mufubenga (2008) stated in their finding, the increased secondary level was associated with an increased level of uptake of optimal doses of IPT_p. Conversely, Sangaré et al. (2010) and Yaya et al. (2018) indicated that the level of education has a negative relationship with the uptake of IPT_p in their studies that had Ugandan data sets. In Tanzania, Mutulei (2013) did not find an association between the level of education and the uptake of IPT_p. The positive relationship between the level of education and the uptake of IPT_p might be as a result of the increase in the level of awareness about issues concerning malaria in pregnancy by the more educated women in addition to the increase in the financial muscle of the more educated hence seeking for health services in times of pregnancy.

Also, there was a positive association between the number of antenatal visits and the uptake of at least a dose of IPT_p. Similar results have been reported from studies of Nkoka et al. (2018), Okethwangu et al. (2019), and Balami et al. (2020). The positive association between ANC visits and the uptake of at least a dose of IPT_p is because IPT is normally administered at every antenatal visit after the first trimester. There is normally an opportunity for those that attend ANC services to take IPT by direct observation. However, Maheu-Giroux and Castro (2014) were concerned about this missed opportunity and a failure in community public health since there are indications of low levels of uptake for IPT_p as compared to the number of ANC attendances.

Similarly, the results of the thesis indicate that there was a positive association between the number of children a woman has ever produced with the uptake of at least a dose of IPT_p. Balami et al. (2020) found a reverse relationship from their study; women with less number of children such as the primigravidae having a higher chance of taking up at least one dose of IPT_p as compared to multigravidae. The reason for this negative relationship might be attributed to the fact the multigravidae women have had opportunities to attend ANC visits and the nature of the services coupled with stock-outs of the therapy might be a discouraging factor for future visits and the primigravidae have a lot of complications that they often need to seek health care services hence higher ANC visits which might lead to higher uptake of IPT_p. The reason for the positive relationship might also be related to multigravidae women appreciating the roles of ANC and IPT_p in the prevention of malaria as compared to primigravidae who might not be aware of the benefits of IPT_p.

Lastly, the results indicate no association between the age of women, place of residence, wealth index, and ownership of the radio as a proxy for listening to radio messages about malaria with the uptake of

at least a dose of IPT_p. Yaya et al. (2018) and Okethwangu et al. (2019) indicated the presence of an association between wealth index and IPT_p uptake. Sangaré et al. (2010) indicated that in Jinja Uganda, there was an association between place of residence (rural or urban) with the uptake of IPT_p. From the 2016 Uganda Demographic Health Survey data, Okethwangu et al. (2019) show the presence of a relationship between the age of a woman and listening to radio messages as associated with the uptake of IPT_p. This, therefore, necessitates the conduction of in-depth analysis using non-cross-sectional data to get feasible determinants of IPT_p in Uganda, even though there has been ethical concern about the use of randomised controlled trials in determining the predictors of IPT_p uptake by the WHO (WHO, 2012).

5.3 Strength and limitations

This dissertation boasts of a large sample used in the analysis. Data from about 4,759 women was used in the analysis from a representative sample of women in all the regions of the country. This thesis will therefore provide possible insight into specific issues that the government of Uganda can use to address the issue of public health failure associated with a low uptake of more than one dose of IPT_p as compared to the ANC attendances and avert the missed opportunity of IPT_p uptake.

The survey data lacks information on clinical indications or health care reasons for non-uptake of IPT_p such as stock-outs of IPT_p. Also, the study looks at only women that had a live birth, excluding those that had stillbirths hence making it difficult to infer some of the reasons for the stillbirths since there is a relationship between uptake of IPT and reduction of stillbirths.

The data concerning the uptake of IPT_p does not provide information on the uptake of the recommended three doses of IPT_p, this is because the prevalence reported is for those that took at least a dose of IPT_p. Besides, most of the information is self-reported, as a result, caution needs to be taken when making conclusions about the findings since causation can not easily be determined with the type of data. Endogeneity is unavoidable in the final model despite efforts to control for confounders. Hence the model represents an independent association as opposed to causal effects. There is a need to have data collected that is time-invariant data.

5.4 Implications

A major challenge for policy-makers currently is harnessing the gap from the missed opportunity of IPT_p uptake of more than one dose and antenatal attendances for pregnant women in Uganda. The findings of this thesis suggest that increased antenatal visits and higher education are needed to have an increased uptake of IPT_p in Uganda. Furthermore, from a policy point of view, this thesis suggests that a nationwide strategy that focuses on having multigravidae women acting as “peer educators” or “community champions” to help

educate on the benefits of IPT_p uptake to women of childbearing age and primigravidae.

5.5 Future research

The reported findings make several contributions to the current literature on the determinants of the uptake of IPT for the prevention of malaria in pregnancy in Uganda among women aged 15 – 49 years. Although data from this cross-sectional study can not be used to determine causality, the results provide direction for further investigations into determinants of IPT uptake, and further investigation is needed concerning reasons why the uptake is low for more than one dose in Uganda; further investigations, including studies that have health-related data from both women that had stillbirths and live birth, women that had the recommended three doses of IPT_P, and studies which are longitudinal (time-invariant) and qualitative in design, are warranted since they can help to address issues concerning possible unobserved endogeneity between the predictors of the uptake of IPT.

5.6 Summary

Several studies have been conducted concerning the determinants of the uptake of IPT_p in Uganda with data mostly coming from the Uganda Demographic Health Survey, this thesis looks at the most recent data from the Uganda Malaria Indicator Survey, and key issues are found that are different from previous findings in Uganda. This dissertation will therefore help to add to the knowledge base and also stress key relevant predictors of the uptake of IPT_p in Uganda. The next chapter concludes the study.

6 Conclusion

This thesis sought to estimate the determinants of the uptake of Intermittent Preventive Therapy for the prevention of MiP in Ugandan women aged 15 – 49 years. Besides the use of nationally representative estimates, this thesis illuminated various predictors associated with the uptake of IPT_p. Furthermore, it estimated the IPT_p-SP uptake by participants' characteristics and predicted the expected uptake of IPT_p-SP from the associated determinants.

Higher education level, number of children born by a woman, and the number of antenatal visits were statistically significant predictors of increased uptake of at least one dose of IPT_p-SP, while age, wealth index, and listening to radio messages about malaria were not significant predictors of the uptake of IPT_p-SP. With the presence of the “public health failure” due to the missed opportunity of having low uptake of more than one dose of IPT_p despite high levels of ANC in Uganda, possible interventions such as promotion of quality education to women, provision of more information concerning malaria causes and its prevention, use of peer mothers to educate women on issues concerning MiP and uptake of IPT_p, and the use of longitudinal data to estimate the causal impact of the predictors of IPT_p-SP might act as solutions.

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