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Evaluating the Impact of Interventions for the Prevention and Management of Malaria in Pregnancy in Guyana

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ABSTRACT

Objective: To evaluate the impact of collaborative interventions between the Ministry of Health (MOH) and the Georgetown Public Hospital Corporation (GPHC), in consultation with the GPHC ObGyn Residency program, on the incidence of Malaria in Pregnancy and associated maternal mortality in Guyana between 2012 and 2014.

Design & Methods: This was a retrospective observational study that analyzed data collected from the MOH Vector Control Unit and GPHC maternal mortality statistics. Pre- and post-intervention data were collectively analyzed.

Results: The results showed a steady rise in incidence of MIP per region prior to the introduction of the interventions in 2012. During and after implementation of the interventions, there was both an immediate (52%) and sustained (>20%) decrease in the number of new cases of MIP. While absolute numbers of maternal mortality secondary to MIP at GPHC were low (1 case per year), they contributed 50-100% of indirect maternal deaths in the years immediately prior to development of the MIP treatment guidelines at GPHC. After these guidelines were officially adopted in 2014, there have been no further maternal deaths associated with malaria.

Conclusions: These results suggest that the MOH and GPHC interventions are associated with significant decreases in both incidence of MIP on a national scale and maternal mortality at the institutional level. Future studies are needed to identify the impact of specific components of these interventions to guide future interventions aimed at eliminating both maternal morbidity and mortality associated with MIP in Guyana.

Key Words: Malaria-In-Pregnancy (MIP); Insecticide Treated Nets (ITNs); Interventions.

INTRODUCTION

MIP poses a huge health care and economic burden worldwide and particularly Guyanese society, due to its associated maternal and neonatal morbidity and mortality. MIP can cause fevers, anemia, seizures, renal failure and pulmonary edema for the mother as well as preterm birth, low birth weight, jaundice and fevers in the newborn[1]. It can also lead to the death of both mother and fetus if inadequately treated. MIP is three times more likely to progress to severe disease and severe MIP has a mortality rate of up to 50%[1]. Recognition of these detrimental consequences of a preventable disease led the Ministry of Health (MOH) to implement policy changes in 2012[4] aimed at reducing the incidence of MIP. The policy included prevention with Insecticide treated nets (ITNs), increased screening and new MIP treatment guidelines. At the Georgetown Public Hospital Corporation, the national tertiary referral center, an evidenced based guideline for the management of MIP was developed by the ObGyn Residency program after interdepartmental consultation in 2012. This served as the "intervention" tool that was used to analyze disease trends in the pre-intervention and

post-intervention periods. It was this guideline that was used to inform the MOH policy and was finally approved by hospital administration in January 2014. This study seeks to evaluate the impact of these interventions at both the national and institutional level.

METHOD

This was a retrospective observational study involving the review of records from the MOH Vector Control unit from 2006 to 2015, and maternal mortality statistics from GPHC 2010 until mid-2016, with comparisons of pre and post MOH/GPHC interventions.

Data collected from the MOH Vector Control Unit included incidence of reported Malaria in Pregnancy, stratified by region and species of malaria and the number of insecticides treated nets (ITN) distributed. Data was analyzed comparing numbers of new cases diagnosed before and after implementation of the new policies. Data for maternal mortality secondary to malaria, was only available from the GPHC, the national tertiary referral hospital, and only for the years 2010-2015 (and 2016, till the date of submission).

RESULTS

During the study period, there were 1821 new cases of MIP with the highest number, 793 (43.5%), in region 4, a non-malaria endemic zone, while 877 (48.2%) cases were from the four regions containing malaria endemic zones (Regions 1,7,8,9). Falciparum species accounted for 802 (44%), vivax 785 (43%), mixed infections 229 (12.7%) and malariae 4 (0.2%).

The highest number of ITNs were distributed in 2013 with the subsequent year (2014) showing a 52% drop in number of new MIP cases. A comparison of the three years preceding implementation (2009-2011, 734 cases) and the 3 years afterwards (2013-2015, 574 cases), shows a sustained decrease in cases of MIP of 22%.

While the overall number of maternal deaths during the study period, secondary to MIP are low (one per year), it is important to note that these were 50% and 100% of the indirect maternal deaths in 2010 and 2011 (the two years prior to development of the new treatment guideline) respectively. It is also important to note, since the official adoption of the evidence-based treatment guideline at GPHC in early 2014, there have been no maternal deaths secondary to MIP.

Table 1. NEW CASES OF MIP

Region	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
1	5	19	29	35	71	74	39	76	34	45	428
2	1	0	6	7	19	3	0	3	9	2	50
3	0	0	0	0	0	1	2	3	1	0	7
4	1	24	48	62	106	160	158	134	70	34	796
5	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	4	1	3	6	2	2	0	18
7	5	3	19	7	19	20	21	24	12	9	139
8	0	3	7	10	25	45	66	39	10	7	212
9	1	3	9	14	12	13	13	15	9	9	98
10	1	7	10	3	6	14	7	19	4	2	73
Total	14	59	128	142	259	333	312	315	151	108	1821

Table 2. NUMBER OF ITN DISTRIBUTED

YEAR	NUMBER OF ITNs DISTRIBUTED
2012	25,800
2013	85,921
2014	30,545

Table 3. NUMBER OF MATERNAL DEATHS DUE TO MALARIA IN PREGNANCY AT GPHC

YEAR	NUMBER OF MATERNAL DEATHS
2010	1
2011	1
2012	1
2013	1
2014	0
2015	0

DISCUSSION, KEY FINDINGS AND RECOMMENDATIONS

The high number of new cases diagnosed in region 4, a non-malaria endemic zone, may be attributable to the following: migration to and from remote areas (which increase direct host-vector contact) [2] and availability of resources at the primary referral hospital in this region where most of the screening, diagnosis and treatment occurs. Naturally acquired immunity to falciparum malaria, which is acquired by women living in endemic zones over years of repeated exposure, protects these women from severe disease and death in malaria endemic regions.[3, 4]

Worldwide, falciparum species is the most common cause of malaria[1]. The results, however, show similar incidence of vivax in pregnant women in Guyana. This may be due to the same cases of vivax being diagnosed and or counted as a new infection multiple times, due to the persistent tissue phase of vivax species, which cannot be treated appropriately with primaquine until after pregnancy[1, 5]. Thus, prevalence of vivax infections may have been overestimated.

This study shows a strong association between preventive strategies (especially the distribution of ITNs) and the decreased incidence of MIP. This is in line with other studies that show ITNs provide significant protection against overall morbidity attributed to malaria[6]. There are however still over 100 cases of malaria in pregnancy per year. Associated maternal and neonatal morbidity could be further reduced by evidenced based international recommendations as outlined in our recommendations below[1, 6, 7].

While the overall absolute number of maternal deaths secondary to MIP are low, it is still important to note they contributed significantly (50-100%) to indirect maternal deaths and since the official adoption of the evidence-based MIP treatment guideline at GPHC in early 2014, there have been no MIP associated maternal deaths,

The weakness of this study is in its inability to extract duplicated cases, lack of data from private hospitals and inability to confirm whether distribution of nets translated to actual use. This was also a retrospective observational study and thus cannot establish causation between the MIP interventions and the subsequent decrease seen in MIP associated maternal mortality. The data is also limited by the quality of documentation at MOH and GPHC.

SUMMARY

The establishment and use of a protocol for prevention and management of malaria in pregnancy by the combined efforts of the MOH and the OBGYN residency program of the Georgetown Public Hospital Corporation had an immediate and sustained positive impact on the number of new cases of MIP and mortality associated with MIP in Guyana between 2012 and 2016.

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Conflict of Interest: None

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