

## Original Research Article

# Correlation of sociodemographic factors and intestinal parasites in pregnant women

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### ABSTRACT

**Background:** Pregnant women often experience more severe intestinal parasitic infections than their non-pregnant counterparts. Intestinal parasitic infections also disturb pregnancy at the maternal and fetal level. Objective of the study was to find out the prevalence of intestinal parasites in pregnant women and its relationship with various socio-demographic factors.

**Methods:** A single stool specimen was collected. A saline and iodine mount was examined microscopically to demonstrate the intestinal parasites. Formol ether Concentration technique was performed to increase the yield of the eggs and larvae. Modified acid-fast staining was done for opportunistic parasitic infections.

**Results:** In this study 300 pregnant women were screened for presence of intestinal parasites. The prevalence of intestinal parasites was 42.67%. Women who practiced hand washing regularly and had knowledge about parasites had lesser infection. The dietary practice of taking green leafy vegetables had protective effect during pregnancy. The prevalence of intestinal parasites was almost same in both rural and urban women. Higher prevalence of intestinal parasites was found in lower socioeconomic class. Women who used river as source of water supply had slightly more prevalence than those who used municipal water. The prevalence of hookworm infection was more in women who never wore sandals.

**Conclusions:** The high prevalence of intestinal parasites in the pregnant women indicates faecal pollution of soil and domestic water supply. Education and awareness regarding intestinal parasites need to be done during their routine antenatal visits. Emphasis should be made on consistent hand washing, consumption of washed leafy vegetables and use of footwear. Deworming of pregnant women should be considered in the national guidelines.

**Keywords:** Intestinal parasites, Pregnant women, Socio-demographic factors

### INTRODUCTION

Intestinal parasitic infections constitute a global health burden causing clinical morbidity in 450 million people; many of these are women of reproductive age and children in developing countries. Elevated intestinal parasitic infections have been seen in developing countries because of poverty, low literacy rate, lack of safe drinking water, poor hygiene, malnutrition and hot and humid tropical climate.<sup>1</sup> Pregnant women are at high risk of intestinal parasitic infection because of their close

relationship with children. Also, most of these worms are transmitted through the soil whilst, the practice of soil eating (geophagy) is common amongst pregnant women in many communities.<sup>2</sup>

Parasitic infections affect tens of millions of pregnant women worldwide, and directly or indirectly lead to a spectrum of adverse maternal and fetal/placental effects. Pregnant women often experience more severe infections than their non-pregnant counterparts.<sup>3,4</sup> Intestinal parasitic infections, especially due to helminths, increase

anemia in pregnant women. The most important cause of pathological chronic loss of blood and iron in the tropics is hookworm and other soil transmitted helminths and malaria in pregnancy.<sup>5</sup> Additionally, hookworm infections induce deficiencies of iron, protein, total energy, and possible folate and zinc. The results of this are low pregnancy weight gain and Intrauterine Growth Retardation (IUGR), followed by Low Birth Weight (LBW), with its associated greater risks of infection and higher perinatal mortality rates.<sup>6</sup>

The present study was planned to know the prevalence of intestinal parasites in pregnant women and understand the relation with the socio-demographic factors which will provide an opportunity to recommend the prevention, control and treatment of the intestinal parasites in pregnant women.

## METHODS

A cross-sectional study was conducted in a tertiary care multispecialty teaching hospital in Mumbai, India from February 2016 to January 2017 after obtaining institutional ethics committee permission. The Sample size was calculated based on the prevalence of intestinal parasites of 25% and precision of 5%.<sup>7</sup> 300 pregnant women were recruited in the study. All pregnant women in the age group of 18 to 40 years with or without complications attending the antenatal clinic for the first time were included in the study. Pregnant women on anti-parasitic drugs were excluded from the study. After obtaining an informed written consent, the clinical as well as demographic history was taken as per the case record form. Three stool specimens were collected from patients on three consecutive visits in a clean, wide mouth, leak-proof screw capped container. Gross examination was performed with respect to its colour, consistency, presence of blood, mucus and visible parasites. A saline and Iodine mount was prepared and examined microscopically to demonstrate helminthic eggs, motility of protozoan trophozoites and larvae of *Strongyloides stercoralis*. Saline and Formol ether Concentration technique was performed to increase the yield of the eggs and larvae. Modified Acid-Fast staining was done for opportunistic parasitic infections. All the pregnant women diagnosed with intestinal parasitic infections were referred to the OBGY OPD for further medical management.

### Statistical analysis

Prevalence of intestinal parasitic infection in the recruited study population was calculated. A descriptive analysis was done for the positivity among different age groups. A multiple logistic regression was performed to predict the odds of parasite detection using predictor variables for hand wash before eating, hand wash after defecation, vegetable consumption, knowledge about parasites/hygiene, use of latrine and age of child,  $p < 0.05$

was considered significant. Variables such as Residence (rural/urban), socio-economic status, source of drinking water were taken up for descriptive analysis only, because data for these variables was highly skewed with a vast majority in one category and only a handful of data points in the other categories, thereby making logical statistical conclusion impossible. Use of footwear is supposed to be associated with hookworm infection only. Hence, it was compared separately with occurrence of hookworm infection using Chi-square test.

## RESULTS

Out of the 300 pregnant women enrolled in the study, intestinal parasites were detected in 128 pregnant women giving a prevalence of 42.67% (Table 1).

**Table 1: Prevalence of intestinal parasites in pregnant women.**

Intestinal parasites detected	Intestinal parasites not detected	Total
128 (42.67%)	172 (57.33%)	300

**Table 2: Age wise distribution of intestinal parasites in pregnant women.**

Age (years)	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
18-25	69(40.4%)	102(59.6%)	171
26-33	46(44.7%)	57(55.3%)	103
34-40	13(50.0%)	13(50.0%)	26
Total	128(42.66%)	172(57.33%)	300

The age of the pregnant women ranged from 18 to 40 years with a mean age of  $26 \pm 4.86$ . The prevalence of parasites was seen predominantly in the age group 34 to 40 years (50 %) followed by 26 to 33 years (44.7%) and 18 to 25 years (40.4%) (Table 2).

The highest prevalence of intestinal parasites was seen in women with Score 0(60.34%) followed by Score 1(50%) and Score 2(9.52%) which had lowest prevalence. Score 1 reduces odds of parasitic infection as compared to Score 0 but the result was not significant ( $p=0.916$ ). Score 2 decreases odds of parasitic infection as compared to Score 0 and the result was significant ( $p=0.027$ ). That means the probability of intestinal parasites in women who washed hands with soap and water sometimes before eating was equal to never washing hands. But women who washed their hands with soap and water regularly before eating had lesser probability of parasitic infections (Table 3).

**Table 3: Correlation of hand washing with soap and water before eating with intestinal parasites in pregnant women.**

Hand washing before eating	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
Score 0 (never)	70(60.34%)	46(39.65%)	116
Score 1 (sometimes)	50(50%)	50(50%)	100
Score 2 (most of the times)	8(9.52%)	76(90.47%)	84
Total	128(42.66%)	172(57.33%)	300

**Table 4: Correlation of washing of hands with soap and water after defecation with intestinal parasites in pregnant women.**

Hand washing after defecation	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
Score 0 (never)	78(78%)	22(22%)	100
Score 1 (sometimes)	44(44.89%)	54(55.10%)	98
Score 2 (most of the times)	6(5.88%)	96(94.11%)	102
Total	128(42.66%)	172(57.33%)	300

The highest prevalence of intestinal parasites was seen in women with Score 0(78%) followed by Score 1(44.89%) and Score 2(5.88%) which had lowest prevalence. Score 1 reduces odds of parasitic infection as compared to Score 0 and the result was significant ( $p=0.002$ ). Score 2 reduces odds of parasitic infection as compared to Score

0 and was highly significant ( $p=6.91 \times 10^{-08}$ ). That means the pregnant women who washed their hands regularly after defecation had lesser probability of intestinal parasites followed by women who sometimes washed hands and the probability was highest in women who never washed hands after defecation (Table 4).

**Table 5: Correlation of consumption of green leafy vegetables and intestinal parasites in pregnant women.**

Intake of green leafy vegetables >4days/week	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
Score 0 (never)	54(73.97%)	19(26.02%)	73
Score 1 (sometimes)	63(49.60%)	64(50.39%)	127
Score 2 (most of the times)	11(11%)	89(89%)	100
Total	128(42.66%)	172(57.33%)	300

**Table 6: Correlation of knowledge and intestinal parasites in pregnant women.**

Knowledge of parasites	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
Score 1 (Present)	20(16.39%)	102(83.60%)	122
Score 2 (Absent)	108(60.67%)	70(39.32%)	178
Total	128(42.66%)	172(57.33%)	300

The highest prevalence of intestinal parasites was seen in women with Score 0(73.97%) followed by Score 1 (49.60%) and Score 2(11%) had lowest prevalence. Score 1 reduces odds of parasitic infection as compared to Score 0 and the result was significant ( $p=0.037$ ). Score 2 reduces odds of parasitic infection as compared to Score

0 and the result was significant ( $p=5.63 \times 10^{-05}$ ). That means the women whose intake of vegetables was always less than four days per week were more prone to intestinal parasitic infections (Table 5). Score 1 reduces odds of intestinal parasitic infections as compared to Score 0 and the result was significant ( $p=0.0006$ ). That

means the probability of intestinal parasites was high in those women who did not have knowledge about

parasites (60.67%) than those who had knowledge about parasites (16.39%) (Table 6).

**Table 7: Correlation of latrine use with intestinal parasites in pregnant women.**

Use of latrine	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
Score 0 (never)	64(63.36%)	37(36.63%)	101
Score 1 (sometimes)	34(34.34%)	65(65.65%)	99
Score 2 (most of the times)	30(30%)	70(70%)	100
Total	128	172	300

**Table 8: Correlation of age of children and intestinal parasites in pregnant women.**

Age of children	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
< 8 yrs.	95(46.34%)	110(53.65%)	205
8-12 yrs.	30(36.14%)	53(63.85%)	83
>12 yrs.	3(25%)	9(75%)	12
Total	128	172	300

The highest prevalence of intestinal parasites was seen in women with Score 0(63.36%) followed by Score 1 (34.34%) and Score 2(30%) which had lowest prevalence. Score 1 decreases odds of parasitic infection as compared to Score 0 but the result was insignificant ( $p=0.565$ ). Score 2 increases odds of parasitic infection as compared to Score 0 and the result was significant ( $p=0.015$ ). Hence, the relation reported by multiple regression was clearly spurious. It was very unlikely that with the use of sanitary latrines, odds of parasitic infections increase. This clearly prove that use of latrine is not an independent predictor variable. It is intimately linked and itself affected by other behavioral attributes of the participants, such as hand washing, vegetable consumption and knowledge. So, when comparing use of latrine alone with occurrence of infection, the significant difference that was observed was actually due to the other confounders. When effects of all variables together were compared in a combined regression model, use of latrine no longer remained a valuable predictor (Table 7).

Prevalence of intestinal parasites was greater in women in close contact with children age less than 8 years (46.34%) followed by 8 to 12 years (36.14%) and lowest in >12 years (25%). Child age 8 to 12 years decreases odds of intestinal parasitic infection as compared to child age <8 years, but the result was not significant ( $p=0.953$ ). Child age >12 years decreases odds of parasitic infection as compared to age of child <8 years but the result was not significant ( $p =0.842$ ) (Table 8).

The prevalence of intestinal parasites was 44.44% and 42.55% in rural and urban population respectively. Data was too skewed for any logical statistical conclusion (Table 9).

The highest prevalence of intestinal parasites was found in lower class (62.5%) followed by lower middle (61.90%), upper lower (41.55%), upper middle (36.36%) and upper (28.57%). Data was too skewed for any logical statistical conclusion (Table 10).

**Table 9: Correlation of residence and intestinal parasites in pregnancy.**

Residence	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
Rural	08(44.44%)	10(55.55%)	18
Urban	120(42.55%)	162(57.44%)	282
Total	128(42.66%)	172(57.33%)	300

**Table 10: Correlation of socioeconomic status and intestinal parasites in pregnancy.**

Kuppusswamy socioeconomic class	Intestinal parasites detected	Intestinal parasites not detected	No. of samples examined
Upper	02(28.57%)	05(71.42%)	07
Upper middle	12(36.36%)	21(63.63%)	33
Lower middle	13(61.90%)	08(38.09 %)	21
Upper lower	96(41.55%)	135(58.44%)	231
Lower	05(62.5%)	3(37.5%)	08
Total	128	172	300

**Table 11: Correlation of water source and intestinal parasites in pregnancy.**

Water source	Intestinal parasites detected	Intestinal parasites not detected	Total no. of samples examined
Municipal	120(42.55%)	162(57.44%)	282
Borewell	01(33.33%)	02(66.66%)	03
River	07(46.66%)	08(53.33%)	15
Total	128	172	300

High prevalence of intestinal parasites was seen in women using river water (46.66%) followed by municipal (42.55%) and borewell (33.33%) as source of water. Data was too skewed for any logical statistical conclusion (Table 11). The highest prevalence of

hookworm was seen in women with score 0(7.5%) followed by score 1(2.5%) and score 2(1%) had lowest prevalence. Barefoot walking was associated with hookworm infestation ( $p=0.044$ ) (Table 12).

**Table 12: Correlation of use of footwear with intestinal parasites in pregnancy.**

Use of footwear outside home	Hookworm detected	Hookworm not detected	Total no. of samples examined
Score 0 (never)	6(7.5%)	74(92.5%)	80
Score 1 (sometimes)	3(2.5%)	117(97.5%)	120
Score 2 (most of the times)	1(1%)	99(99%)	100
Total	10	290	300

Chi-square statistic = 25.71, degrees of freedom = 1,  $p=0.044$

## DISCUSSION

Intestinal parasitic infections are one of the major health problems in several developing countries, including India.<sup>8</sup> In India, overall prevalence rate of intestinal parasitic infestation ranges from 12.5% to 66%, with varying prevalence rate for individual parasite.<sup>9-12</sup> Pregnant women often experience more severe infections than their non-pregnant counterparts.<sup>3,4</sup> Moreover intestinal parasitic infections disturb pregnancy at the maternal and fetal level.<sup>13</sup>

In India, studies have been carried out on prevalence of intestinal parasites in general population but studies on prevalence of intestinal parasites in pregnant women are lacking.

The present study was carried out to find out the prevalence of intestinal parasites in pregnant women and its relationship with various socio-demographic factors.

The prevalence of intestinal parasites in the present study was 42.67% (Table 1). The prevalence of intestinal parasites is indicative of fecal pollution of soil and domestic water supply due to poor sanitation and improper sewage disposal. Also, it can be attributed to unhygienic practices and lack of awareness of transmission of these intestinal parasites.

In the present study, the age of the pregnant women ranged from 18 to 40 years with a mean age of  $26\pm 4.86$  (Table 2). The prevalence of parasites was seen predominantly in the age group 34 to 40 years (50 %) followed by 26 to 33 years (44.7%) and 18 to 25 years (40.4%). Studies conducted by Usip et al, and Alli et al, also showed a similar finding.<sup>4,14</sup>

Hands are the main pathways of germ transmission during health care. Hand washing education in the community reduces the number of people who get sick with diarrhea by 31%, reduces diarrheal illness in people

with weakened immune systems by 58% and reduces respiratory illnesses, like colds, in the general population by 21%.<sup>15</sup>

In the present study the probability of intestinal parasites in women who washed hands with soap and water sometimes before eating was equal to never washing hands. But women who washed their hands with soap and water regularly before eating had lesser probability of parasitic infections (Table 3). Also, the pregnant women who washed their hands regularly after defecation had lesser probability of intestinal parasites followed by women who sometimes washed hands and the probability was highest in women who never washed hands after defecation (Table 4). These findings were similar to the study conducted by Derso A et al, and Mengist et al.<sup>1,16</sup> The above findings suggest that the pregnant women should be made aware of the importance of hand washing in the prevention of the intestinal parasitic infections and it has to be emphasized that hand washing has to be done regularly as washing hands sometimes is as good as not washing hands.

In the developing world, young women, pregnant women, and their infants and children frequently experience a cycle where under nutrition (macronutrient and micronutrient) and repeated infection lead to adverse consequences that can continue from one generation to the next. The poor growth resulting in underweight and stunting leaves reproductive-age women at risk in their early pregnancies of delivering premature or LBW infants.<sup>17</sup>

In the present study, it was found that the women whose intake of vegetables was always less than four days per week were more prone to intestinal parasitic infections (Table 5). In a study by Dutta et al, showed that dietary practice of taking green leafy vegetables and fruits had protective effect during pregnancy.<sup>7</sup> A study conducted by Derso A et al, has reported that having unwashed vegetables increased the risk of intestinal parasites.<sup>1</sup> So the pregnant females should be advised to have plenty of leafy vegetables but emphasis should be made on washing it thoroughly before consumption.

Maternal awareness about health care is the most cost-effective intervention for reducing maternal mortality, morbidity and complications before and after childbirth.<sup>18</sup> Education is considered as one of the most basic strategies for health improvement and promotion of quality of life.<sup>19</sup> The first step before implementing any educational intervention is to identify mothers 'knowledge, needs and opinions. In fact, evaluation of women 's knowledge can indirectly determine their basic training needs.<sup>20</sup> In the present study, knowledge about parasites in pregnant women reduced odds of intestinal parasites which was significant (Table 6). Lack of knowledge decrease awareness about infections and thus decrease hygienic practices which ultimately increase risk of infections. The cause of insufficient knowledge of

mothers in the mentioned study may be due to the low educational level of mothers. Similar findings were seen in a study conducted by Okeke et al.<sup>21</sup> So the pregnant women should be made aware about the transmission, effect on maternal and fetal health and measures to prevent these infections. In the present study the use of latrine when compared alone with occurrence of intestinal parasitic infection clearly reduces the occurrence of infection in women those who never used latrines as against women who sometimes used latrines and in women those who regularly used latrines. However, on multiple logistic regressions it was proven that the use of latrine cannot be used as an independent predictor and is itself affected by other variables that also influence occurrence of intestinal parasitic infection (Table 7). Hence the pregnant women should be counseled regarding the benefits of use of latrine and emphasis should also be made on other hygienic practices also so as to avoid infection.

In the present study the intestinal parasitic infection rate was found to be more in women who had children less than 8 years as compared to those with older children though the association was not statistically significant (Table 8). Alli et al, have reported a significant correlation between women with children less than 8 years of age and the prevalence of intestinal parasites.<sup>4</sup> Kavathia et al, has reported predominance of intestinal parasites in children aged 6 to 10 years and 5 to 7 years respectively.<sup>22</sup> The mothers of younger children are expected to come in close contact with their children during their daily activities leading to the more prevalence in these mothers. In the present study, prevalence of intestinal parasites was found to be almost similar both in rural and urban women (Table 9). Other studies in pregnant women like Derso A et al, and Mahande et al, have shown predominance in rural populations.<sup>1,23</sup> Since majority of the women in the present study were from lower socioeconomic status, the surrounding environmental factors, level of sanitation and hygiene would have been similar to that of a rural set up. Since these are the major confounding factors for the transmission of intestinal parasitic infection the resulting prevalence is expected to be the same. In the present study, majority of pregnant women belonged to low socioeconomic class and had higher prevalence of intestinal parasites (Table 10). Dhanabal et al, has reported high prevalence of intestinal parasites in low socioeconomic areas from south Chennai.<sup>24</sup> It is expected that people from low socioeconomic status will have lesser access to clean water supply and sanitary facilities. Also, lack of education and awareness regarding hygienic practices may be responsible for higher prevalence of intestinal parasites in this group.

Women who used river as source of water supply had slightly more prevalence (46.66%) than those who used municipal water (42.55%) as source of water supply (Table 11). Open air defecation is practiced in rural areas which might lead to transmission of intestinal parasites

through flies or pollution of river water which might have resulted in more prevalence.

Since the prevalence was also seen in municipal water source, it indicates that there needs an improvement in the sanitation facilities and water supply in urban area. As the mode of infection of hookworm is penetration of skin, we evaluated barefoot walking and hookworm infection. The prevalence of hookworm infection was more in women who never wore sandals (7.5%) as compared to those who wore sandals for most of the time (1%) (Table 12). Tesfaye et al, and Lorocque et al, have also noted positive correlation between barefoot walking and prevalence of hookworm infection.<sup>25,26</sup> This suggests that the pregnant women should be counseled about their personal hygiene including, avoiding walking barefoot to prevent infections with soil transmitted helminths like hookworm.

## CONCLUSION

The high prevalence of intestinal parasites in the pregnant women indicates faecal pollution of soil and domestic water supply due to poor sanitation and improper sewage disposal. Education and awareness regarding intestinal parasites need to be done during their routine antenatal visits. Emphasis should be made on consistent hand washing, use of footwear and the use of latrine.

Counseling the pregnant women about the dietary benefits of taking green leafy vegetables and fruits daily should be done but emphasis should be made on proper washing before consumption. In developing countries as anemia and malnourishment preexist, the presence of intestinal parasites is a double burden in pregnancy which may affect the pregnancy and its outcome. So, workup and treatment of the intestinal parasites can be considered especially in anemic and malnourished women. Currently deworming is not a part of routine antenatal checkup in India. But considering the fact that sanitation and hygiene is suboptimal in most parts of the countries, there should be a strong emphasis on the recommendations in the National guidelines regarding deworming in pregnancy which is currently not been followed in all developing countries.

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