

Maternal Morbidity in Early Pregnancy in Rural Bangladesh

*Women report many symptoms early in pregnancy,
revealing a burden of illness requiring attention.*

More than 350,000 women die every year from pregnancy-related causes,¹ 99% in developing countries,² where fewer than half of women receive adequate antenatal care.³ The fifth Millennium Development Goal [MDG] proposes to reduce maternal mortality by 75% and prevent morbidity through universal access to reproductive health services, including antenatal care by 2015.³ Yet, little remains known about the extent, severity or consequences of morbidity during pregnancy in underserved societies,^{4,5} especially during the first trimester in rural regions when pregnancy often proceeds undetected by the health care system.³ In rural Bangladesh, nearly 90% of deliveries occur at home and 54% of women do not receive formal antenatal care.⁶ The first antenatal visit typically occurs at ~5 months gestation, limiting studies of maternal morbidity to rely on mid-late pregnancy visits or postnatal reports.⁷ Critical gaps in information exist on morbidity and health care service utilization early in pregnancy in underserved, rural settings.

A Study of Early Pregnancy Morbidity: JiVitA-1

Taking advantage of the early pregnancy detection system of the JiVitA-1 maternal vitamin A or beta-carotene supplementation trial,⁸ which involved visiting 105,000 women every five weeks to identify pregnancies in the first trimester, we determined the prevalence, duration and severity of 23 morbidity symptoms and illnesses, defined from symptomatic reporting, during the first trimester of pregnancy in rural northern Bangladesh (Table 1). This study provides evidence of a substantial burden of morbidity in the first trimester of pregnancy, in a typical rural population that rarely seeks antenatal care early in pregnancy.^{6,9} Estimates of morbidity were obtained using a home-based surveillance system with a large number of trained, female interviewers (n=150, with 56 workers collecting 75% of all data), supervised throughout the study in their execution of a standardized questionnaire.⁸ Mid-upper arm circumference measurements reflecting nutritional wasting due to energy catabolism during illness, and treatment seeking histories were interpreted to reflect severity of morbidity symptoms¹¹ and opportunities to indirectly validate reported morbidities. Women with symptoms of likely chronic duration or nutritional consequence (e.g., poor appetite, diarrhea, night blindness) tended to be wasted, while those reporting edematous symptoms (e.g., facial and hand swelling) tended to have a larger arm circumference, as one would expect.

Morbidity burden of early pregnancy

Ninety-three percent of women reported at least one morbidity symptom in a given week. The most prevalent symptoms involved the gastrointestinal system (nausea, vomiting, poor appetite, lower abdominal pain), reproductive system (vaginal discharge), and generalized symptoms (low grade fever, weakness, breathlessness at rest) (Figure 1). Symptoms such as nausea, vomiting, breast pain or tenderness, commonly occur during early pregnancy, reflecting normal physiologic hormonal changes. Other symptoms may reflect pre-existing or chronic conditions detected early in pregnancy, such as night blindness (due to chronic vitamin A deficiency) or hepatobiliary disease.

Our analysis of JiVitA-1 data has been able to quantify the average number of days women experience morbidity symptoms in the first trimester of pregnancy (Figure 1). Since primigravids tended to enter the trial later in gestation, age and parity tended to decrease, while education, literacy and socio-economic status tended to increase with advancing gestational week of assessment. Yet nutritional status, an important covariate for health, remained stable. Several morbidity trends were consistent with expectation: a peak in nausea and poor appetite was noticed at ~9 weeks and vomiting at ~11 weeks gestation. On the other hand, morbidities expected to be less influenced by gestational age, such as fever and abdominal pain, remained stable in prevalence across the first trimester. We have estimated that women in this rural setting had poor appetite, nausea or vaginal discharge, each, 40 to 50% of the time, and low grade fever, lower abdominal pain, cough, vomiting, severe headache or painful urination, each, 5 to 30% of the time.

Symptoms that prompted women to seek treatment ~40 to 80% of the time, included high fever, watery stools, jaundice or yellow eyes (reflecting possible hepatobiliary disease), and hand swelling (representing possible generalized edema). Other symptoms that prompted women to seek any treatment 10% to 30% of the time, included convulsions, lower abdominal pain, severe headache, rapid breathing, and vomiting which correspond with WHO warning signs that warrant evaluation by a health provider.¹¹ For most morbidities, when treatment was sought, it was largely from non-allopathic or traditional providers.

Illness	Definitions
Anemia	Both symptoms present in the past 30 days: 1) Breathlessness at rest, and 2) Weakness
Morning sickness	Nausea and vomiting
Reproductive tract infection	1) Vaginal discharge and lower abdominal pain and high fever; or 2) Vaginal discharge and painful urination
Urinary tract infection	1) Painful urination and lower abdominal pain; or 2) Painful urination and high fever
Excessive vomiting (hyperemesis gravidarum)	Vomiting for 7 of the past 7 days
Gastroenteritis	1) Diarrhea (watery stools >4x/d); or 2) Bloody / mucoid stools and vomiting; or 3) Bloody / mucoid stools and lower abdominal pain.
Pneumonia	Any 2 of the following: 1) Productive cough; 2) Rapid breathing; and 3) High fever.
Abnormal bleeding	Vaginal spotting for 7 of the past 7 days
Hepatobiliary disease	All 3 of the following: 1) Right upper quadrant (liver) pain; and 2) At least one symptom of elevated bilirubin or biliary obstruction: jaundice, yellow eyes, ash colored stools, tea colored urine; and 3) At least one constitutional symptom: low grade fever, poor appetite, nausea, vomiting
Gestational Edema	Swelling of hands or swelling of face

Table 1. Definitions of maternal illnesses in the first trimester based on combined symptoms.

The most prevalent illnesses included anemia (36%), morning sickness (17%), and reproductive tract infections (RTI) (7%) (Figure 2). The high prevalence of anemia is comparable to other hemoglobin-based estimates, although in our study population in northern Bangladesh, gestational anemia tends to be related more to hemoglobinopathies than iron deficiency.¹² A lower than expected prevalence of morning sickness (17%) may be accounted by our definition requiring both nausea and vomiting (to increase specificity), while many studies use nausea alone to report prevalence rates of 50-90%.¹³ The 7% prevalence of RTIs most likely does not reflect sexually transmitted infections but instead captures women with either normal discharge or infections such as bacterial vaginosis, which has been associated with preterm labor¹⁴ and a condition that maternal vitamin A supplementation markedly reduced during the JiVitA-1 trial.¹⁵ Urinary tract infections were reported in 5% of women and have been associated with pyelonephritis, preterm birth, and chorioamnionitis, underscoring the importance of identifying and treating such infections during pregnancy.

Comparability and novelty of findings

Our estimates of morbidity are comparable to those obtained in an earlier Johns Hopkins study of first trimester morbidity among 772 Nepalese

pregnant women in the placebo control arm of the maternal vitamin A or beta-carotene trial carried out in the trial in the mid-nineties.⁴ Comparable frequencies suggest stable and replicable burdens of these first trimester morbidities when collected by similar recall methods in rural settings along the northeastern Gangetic floodplain.

The findings of this study, revealing a substantial prevalence of multiple symptoms, derive from a large, population-based sample in northern Bangladesh, obtained by 7-day histories to minimize recall bias, and standardized methods implemented by trained staff.⁸ Antenatal care that can address these health concerns are likely, in the future, to encourage women to utilize health services for illnesses throughout their pregnancy.⁵ mHealth approaches, based on cell phone networking, may be able to make major strides to identify and treat early antenatal illness. Our findings support a critical need to improve antenatal care to detect and treat under-recognized morbidity early in pregnancy, and thereby accelerate progress towards MDG 5. The key findings of this brief have been submitted to the International Journal of Gynecology and Obstetrics.¹⁶

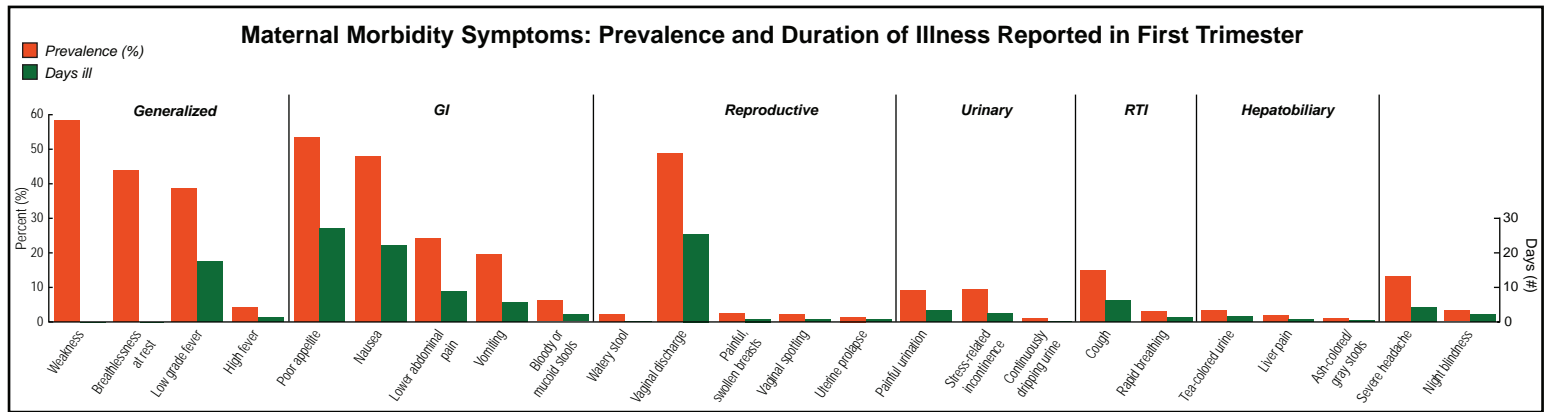


Figure 1. Prevalence and duration of illness for reported maternal morbidity symptoms in first trimester.

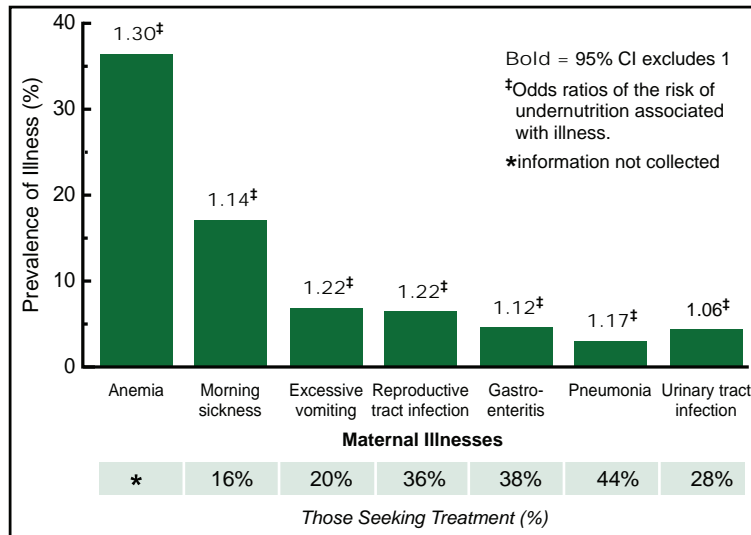


Figure 2. Prevalence of illness, percent seeking treatment, and odds of undernutrition (MUAC <21.5cm) associated with maternal illnesses based on combined reported symptoms.

JiVitA is a project of the Center for Human Nutrition of Johns Hopkins University, spanning 19 unions of Gaibandha and Rangpur Districts in rural Northwestern Bangladesh. JiVitA has been conducting community trials, supported by epidemiologic, ethnographic, and laboratory research since 2000, to reveal the impact of public health interventions in order to guide nutrition and health programs and policies in Bangladesh and elsewhere in South Asia.

References

- 1) WHO, UNICEF, UNFPA, WorldBank. Trends in Maternal Mortality: 1990 to 2008. Geneva: WHO; 2010.
- 2) Ronsmans C, Graham WJ. Maternal mortality: who, when, where, and why. Lancet 2006;368:1189-200.
- 3) Millennium Development Goals Report. United Nations 2010, New York.
- 4) Christian P, West KP Jr, Khattry SK, Katz J, LeClerq SC, Kimbrough-Pradhan E, Dali SM, Shrestha SR.. Vitamin A or beta-carotene supplementation reduces symptoms of illness in pregnant and lactating Nepali women. J Nutr 2000;130:2675-82.
- 5) Filippi V, Ronsmans C, Campbell OM, Graham WJ, Mills A, Borghi J, Koblinsky M, Osrin D. Maternal health in poor countries: the broader context and a call for action. Lancet 2006;368:1535-41.
- 6) Bangladesh DHS 2007. National Institute of Population Research and Training, Mitra and Associates, and Macro International 2009. Dhaka, Bangladesh and Calverton, Maryland, USA.
- 7) Souza JP, Parpinelli MA, Amaral E, Cecatti JG. Population surveys using validated questionnaires provided useful information on the prevalence of maternal morbidities. J Clin Epidemiol 2008;61:169-76.
- 8) Labrique AB, Christian P, Klemm RD, Rashid M, Shamim AA, Massie A, Schulze K, Hackman A, West KP Jr. A cluster-randomized, placebo-controlled, maternal vitamin a or beta-carotene supplementation trial in bangladesh: design and methods. Trials 2011;12:102.
- 9) Koenig MA, Jamil K, Streatfield PK, Saha T, Al-Sabir A, El Arifeen S, Hill K, Haque Y. Maternal health and care-seeking behavior in Bangladesh: findings from a national survey. Int Fam Plan Perspect 2007;33(2):75-82.
- 10) Anwar I. Perceptions of quality of care for serious illness at different levels of facilities in a rural area of Bangladesh. J Health Popul Nutr 2009;27(3):396-405.
- 11) WHO DoRHAR. Integrated Management of Pregnancy and Childbirth. Pregnancy, childbirth, postpartum and newborn care: a guide for essential practice. 2nd ed. WHO 2009 Geneva, Switzerland.
- 12) Merrill RD, Shamim AA, Ali H, Jahan N, Labrique AB, Schulze K, Christian P, West KP Jr. Iron status of women is associated with the iron concentration of potable groundwater in rural Bangladesh. J Nutr 2011;141:944-9.
- 13) Chan RL, Olshan AF, Savitz DA, Herring AH, Daniels JL, Peterson HB, Martin SL. Severity and duration of nausea and vomiting symptoms in pregnancy and spontaneous abortion. Hum Reprod 2010;25:2907-12.
- 14) Hawkes S, Morison L, Chakraborty J, Gausia K, Ahmed F, Islam SS, Alam N, Brown D, Mabey D.. Reproductive tract infections: prevalence and risk factors in rural Bangladesh. Bull World Health Organ 2002;80:180-8.
- 15) Christian P, Labrique AB, Ali H, Richman MJ, Wu L, Rashid M, West KP Jr. Maternal vitamin A and beta-carotene supplementation and risk of bacterial vaginosis: a randomized controlled trial in rural Bangladesh. Am J Clin Nutr 2011;94(6):1643-9.
- 16) Kim J, Labrique AB, West KP, Jr., Rashid M, Shamim AA, Ali H, et al. Maternal morbidity in early pregnancy in rural Northern Bangladesh. IJGO, 2012 (under review).



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