University Medical Center Goettingen
Institute for Medical Microbiology
Kreuzbergring 57
D-37075 Goettingen / Germany
Phone: +49 551 39 5801
Fax: +49 551 39 5861
Email: ugross@gwdg.de

Burdens and risk factors of infectious diseases in rural southwest Ghana in pregnant women and the correlations on neonates a cross sectional pilot study

A. E. Gordon[1], F. Völker[1], P. Cooper[2], G. Koethe[2], A. Uy[1], O. Zimmermann[1], U. Groß[1]
[1] Georg-August Universität Göttingen, Germany / [2]St. Martin de Porres Hospital, Eikwe, Ghana

Introduction

According to UN reports, Sub-Saharan Africa has the highest maternal and neonatal mortality rate and is among the regions showing the least progress. While infectious diseases play a major role, current knowledge on prevalence and impact outside urban communities is limited.

In 2000 the UN passed eight millennium development goals designed to improve living conditions in developing countries. For the health sector we saw objectives to 1) reduce maternal and under five mortality and 2) combat HIV/AIDS, malaria and other major diseases.

Data from the WHO (May 2012) shows that the lifetime risk of a women (≥15 yrs) dying from a maternal cause is 1:3800 in developed countries vs 1:150 in developing countries. 99% of maternal deaths occur in developing countries of which more than half are reported from Sub Saharan Africa.

In Ghana, the under five mortality rate is 72 per 1,000 live births and the neonatal mortality rate 28 per 1,000 live births (USA neonatal mortality of 4/1,000; unicef, 2012). Over 85% of neonatal mortality rate in this country is due to prematurity and infection (Edmond et al., 2008).

Maternal infections, which is the third most common cause of maternal death, is an intensive field of research. Current studies focus mainly on single infections like malaria and AIDS, irrespective of a possible broader spectrum of infectious risk factors and their potential interdependencies (Apea-Kubi et al., 2006; Duda et al., 2005). Due to this, we determined infectious risk factors that have an effect on mother and neonatal morbidity/mortality rate in a rural setting in Ghana. We focused on maternal infections that either jeopardise directly maternal health or have a potentially negative effect on the newborn by maternal-foetal transmission.

In a cross-sectional pilot study 180 pregnant women and 319 neonates were screened at St. Martin de Porres Hospital in Eikwe, western Ghana to determine the frequency of bacterial, viral, and parasitic infections in a rural setting.

Methods

The maternal screening was conducted over a 3 months period from October to December 2011 in which low vaginal swabs and blood samples were taken. The vaginal swabs were cultured to detect for group B streptococci (GBS), listeria and gonococci.

Second the neonatal sample was collected from April to August 2013. Anal and mouth swabs and umbilical blood samples were collected. All colonies isolated from the neonatal sample were differentiated, allowing a complete bacteriological screening.

All swab results from both screening projects were confirmed by MALDI-TOF mass spectrometry at the University Medical Centre Göttingen (UMG)/Germany.

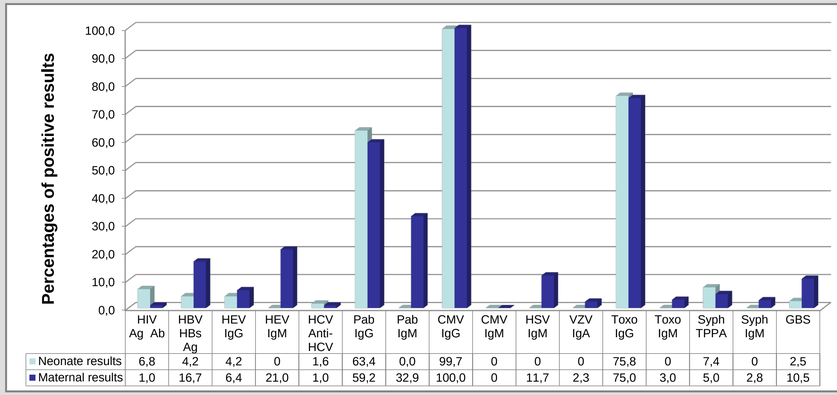
The serum of both maternal and neonatal blood samples were tested for immune responses to HIV (Ag/Ab), HBV (HBsAg), HCV (Anti-HCV), HEV (IgM/IgG), VZV (IgA/IgG), HSV (IgM/IgG), CMV (IgM/IgG), Parvovirus B19 (IgM/IgG), Rubella virus (IgM/IgG) and Toxoplasma gondii (IgM/IgG).

Treponema pallidum screening was based on TPPA test and the detection of IgM antibodies, all these tests were also undertaken at the UMG.

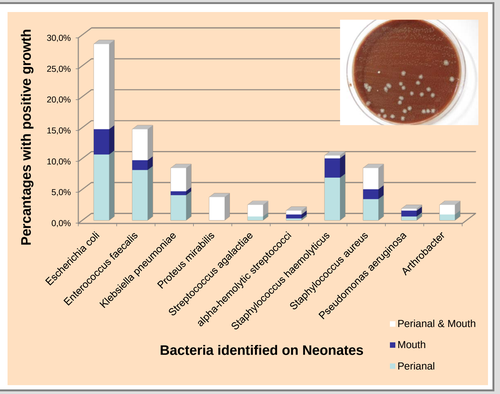
The basic blood parameters were also tested, such as haemoglobin, white and red blood cells.

Results

Results show a broad spectrum of maternal and neonatal infections. High maternal GBS (10.6%) carriage rates cause a significant contamination of the neonatal flora. In 7% of neonatal cases streptococci were found, of which 2.5% were GBS. Of these 8 neonates 3 died, which amounts to 37% mortality. Enterobacteria were the most common group found on neonates, totalling 44%, however occurrence of bacteria on neonates was 72% correlating well with the vaginal deliveries of 71.2%. Listeria and gonococci were not detected on any of the mothers or children. Plasmodia parasites were identified in 10.6% of the maternal study population and on two premature neonates that died. Syphilis (TPPA) was tested and proved positive on 5% of the maternal and 7% of the neonatal sample.
Additionally, high maternal (17%) and neonatal (4.2%) seroprevalences for HBV were shown. Other hepatotropic viruses (HCV/HEV) were frequent with an increased incidence in the maternal samples. The mortality rate for the neonates was 8%, of which 56% died during the first day of life, followed by 32% antepartum/during labour, the remaining 12% died after 2-4 days.



	HIV Ag Ab	HBV HBs Ag	HEV IgG	HEV IgM	HCV Anti-HCV	Pab IgG	Pab IgM	CMV IgG	CMV IgM	HSV IgM	VZV IgA	Toxo IgG	Toxo IgM	Syph TPPA	Syph IgM	GBS
Neonate results	6,8	4,2	4,2	0	1,6	63,4	0,0	99,7	0	0	0	75,8	0	7,4	0	2,5
Maternal results	1,0	16,7	6,4	21,0	1,0	59,2	32,9	100,0	0	11,7	2,3	75,0	3,0	5,0	2,8	10,5



Conclusion

Given the noteworthy prevalence of bacterial and viral infections, better screening and managing of pregnancies and neonatal care is advisable. In practice, an antibiotic GBS prophylaxis during labour as well as a systematic HBV vaccination program and screening for syphilis need to be taken seriously. Risk assessment leading to proposals to local policy makers on managing the respective diseases should be considered.

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