Title: “A Study on Typhoid Fever in Elmina in the Central Region of Ghana”

Sponsors: Ghana Health Service and the University of Michigan

Grant amount: $3850

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Executive Summary

Background
Typhoid fever is a systemic bacterial disease caused by *Salmonella enterica* serotypes *S. typhi* and *S. paratyphi typhi*. Worldwide, typhoid fever affects approximately 26.9 million people annually. Typhoid fever remains a significant public health problem in developing countries, such as Ghana. Central Region was one of the three regions to record the highest incidence of typhoid fever in Ghana in 2011. Additionally, preliminary mapping of the incidence of typhoid perforations at Cape Coast Teaching Hospital showed that majority of the cases were from Elmina, Central Region.

General Aim
This study sought to identify the knowledge, attitudes and practices with regard to typhoid fever and to identify chronic carriers of the disease in Elmina.

Materials and Methods
This project involved both a diagnostic study and a community based survey. Questionnaires were administered to 250 respondents to explore the knowledge, attitudes and practices (KAP) of the community concerning typhoid fever. The diagnostic arm of the study involved screening community members using stool cultures to identify chronic carriers of *Salmonella typhi*.

Outcomes
Of the 250 respondents who were interviewed, 222 people (88.8%) had heard about typhoid fever. Six (6) out of 216 patients (2.8%) tested positive for *Salmonella typhi* and were treated appropriately. The results of the analysis will be disseminated in research papers and policy briefs.
INTRODUCTION

Typhoid fever remains a significant health burden globally, particularly in resource poor regions of the world. The disease is caused by *Salmonella enterica* serotypes S. typhi and S. paratyphi A, B, C. It is common among crowded and impoverished populations with inadequate sanitation and is transmitted through ingestion of water or food that have been contaminated by faeces or less commonly, urine, of infected humans. Without effective treatment, typhoid fever has a case fatality rate of 10 – 30%. Approximately 2 to 5% of the population infected with S. *typhi* become chronic carriers. Chronic carrier rates are higher among women and among persons with biliary abnormalities such as gallstones.

The estimated global burden of typhoid fever is approximately 26.9 million. Similarly, Ghana is not immune to the burden of typhoid fever and its associated complications. In Ghana, 103,353 cases of typhoid fever and 793 deaths were recorded in 2011, with Central Region being one of the three regions to record figures higher than the national average. Regrettably, the knowledge, attitude and practices of Ghanaians that contribute directly or indirectly to the burden of typhoid fever in Ghana have been overlooked. This makes targeted public health interventions almost unattainable.

This project therefore, seeks to fill the knowledge gap and expand our understanding of the possible factors that contribute to the high prevalence of typhoid fever in the country; also to identify and manage chronic carriers of *S. Typhi* in Elmina, the district capital of the KEEA municipal assembly in the Central Region of Ghana.

RESEARCH OBJECTIVES

The ultimate aim of this research is to conduct a study of typhoid fever in Elmina, Ghana in order to target the affected communities for public health interventions. The specific objectives are to:

- Understand the knowledge, attitudes and practices of the community concerning typhoid fever.
- Screen community members and to identify and treat appropriately chronic carriers of *S. typhi* and in the study community.
- Disseminate information that will lead to the implementation of effective preventive interventions and public health policies.
METHODOLOGY

Study Area, Population, and Design
The study was conducted in Elmina, in the KEEA District of the Central Region of Ghana. It has a population of about 25,560. The targeted respondents were household members 18 years and above. A multi-staged sampling technique was utilized. Clusters were first identified and selected using random sampling, followed by a systematic sampling of households in each selected cluster.

Data Collection and Processing
Data on the sociodemographic characteristics of the study participants, as well as knowledge attitudes and practices on typhoid fever were collected using a pretested questionnaire by interview. The quantititative data from the survey was entered using SPSS and later exported to STATA for further management and analysis. Preliminary data analysis involved frequencies, percentages, cross tabulations and chi-square.

Two (2) clean containers were given to each respondent 24 hours apart. Stool samples were transported in ice chests to the lab within 8 hours of collection. Stool samples were processed as per the protocol.

ACTIVITIES

Ethical Considerations
Ethical clearance was obtained from the University of Cape Coast Ethical Review Board on 9th June, 2015. Participation in the study was strictly on voluntary basis. Persons who consented to the study by signing the consent forms were assured of the freedom to withdraw participation at any point during the course of the study. Confidentially and anonymity of participants was guaranteed.

Development of questionnaire
The project team was able to exchange ideas and developed a 55-point questionnaire, as well as refined the methodological tools. The questionnaire covered the following areas: background information, media exposure, knowledge about typhoid fever, attitudes and practices related to typhoid fever, sanitation practices as well as health seeking behaviours.
Recruitment and training of personnel
Three graduates (two males and a female) were identified and praised to assist with the project. Training of personnel was done to equip them appropriately for the work ahead and to build their capacity for postgraduate research. Field assistants were taken through the questionnaire, both in English language and the local dialect – Fante. Role play demonstrations were conducted as part of training to enhance the quality of field work. The laboratory personnel were also identified and briefed on the study and all other protocols.

Formation of protocol for laboratory work
The protocol for the isolation of *Salmonella typhi* was developed in consultation with some microbiologists from the University of Cape Coast, School of Medical Sciences and laboratory technicians from Cape Coast Teaching Hospital. Necessary changes were then made to the protocol to ensure smooth operation at the start of the study.

Community entry and mapping
Community entry was done on 15th June, 2015. Various community leaders were met and briefed on the project. We were warmly accepted and shown the different areas of the community which helped with the mapping.

Field work - data collection and sample collection
Field work started on 22nd June, 2015, successful pre-testing of the study. The pre-testing was conducted from the 16th to 17th June, 2015 in Bakaano, a community in Cape Coast with similar socio-demographic characteristics as Elmina (the study area). Questionnaires were administered to 250 respondents by interview. Two stool sample containers were administered to respondents at least 24hrs apart. Stool specimen were collected in clean containers and transported to the lab within 8 hours of collection. The samples were handled as per protocol.

Follow up:
Carriers identified during the study were treated appropriately as per sensitivities. They were then referred to the outpatient department for further follow up and possible contact tracing as needed.
**Dissemination of Results**

Forums will be organized within the local community to communicate research findings to opinion leaders and community members. Also, a summary of the research will be disseminated to the local and district assemblies. The research findings will also be presented to learned societies and published in peer reviewed journals including the Ghana Medical Journal.

**RESULTS**

**Community-based survey**

*Sociodemographic data.* A total of 264 people were sampled randomly. Out of these, twelve (12) persons declined and two (2) were invalid. Two hundred and fifty (250) respondents were included in the study. About 70% of the study participants were females. This is mainly because the men were mostly out to sea conducting their fishing activities, whiles women stayed mostly at home. The mean age was 38.91 +/- 15.72 years.

Majority of the people sampled were Fantes (80.7%), traders (32.8%), married (47.4%) and had attended senior high school (37.8%). Most people (88%) were insured under the National Health Insurance Scheme (NHIS).

*Knowledge.* Majority (88.8%) of the 250 respondents that participated in the had heard of typhoid fever. Among those who had heard about typhoid fever, about 40% reported that typhoid was a food borne disease, while about 32.8% reported that it was water borne disease. About 8% indicated that typhoid could be transmitted through direct contact and 16% believed it was airborne. The majority of respondents (49.2%) attributed the cause of typhoid fever to germs; 28% attributed it to mosquitoes; about 7% to sunlight and about 4% to a curse.

*Attitudes.* About 71% of respondents believed a person could be a carrier of typhoid and only about half of them thought carriers could transmit the disease to others. About 31% of people said they had suffered from typhoid fever in the past. Three out of five people believed cooking food properly could prevent typhoid fever. About two out of five respondents believed washing of hands with soap and water would prevent the disease. About 96% believed there was a role of frequent hand washing in infection prevention; about 1% said there was no role and about 3% did not know.
Practices. Almost 60% of respondents drank pipe borne water and about 38% of respondents drank sachet water. About 50% of respondents used dustbins as a means of disposing of rubbish, 35% utilized community waste disposal and 8.5% openly burnt their rubbish.

About 57.6% reported that they always washed their hands before cooking; about 30% washed sometimes and about 12% never washed their hands before cooking. Almost 80% of respondents always washed their hands before eating; about 20% only washed their hands sometimes before meals and only 1 person admitted to never washing their hands before meals.

About 85% of respondents reported always washings their hands after using the toilet, compared to about 15% who sometimes washed their hands after using the toilet. In terms of toilet facilities, 40% of respondents reported they often use water closet (WC); 22.1% use public/ shared toilets; 13% utilized water bodies and about 12% used Ventilated Improved Pits.

Diagnostic study

Culture results. Out of the 250 respondents, 216 people submitted a total of 358 stool samples for culture and sensitivity. Of the 216 respondents who submitted samples, 132 people submitted 2 each (total – 264), at least 24 hours apart; 94 people submitted only a sample each. Only 34 respondents failed to bring any sample at all. A total of 6 out of the 216 respondents who submitted stool samples tested positive for Salmonella spp(2.78%).

The six Samonella spp. isolates were subjected to antibiotic susceptibility testing, using the modified Kirby Bauer method with a twelve panel antibiotics disc. From Table 1, the isolates showed different patterns to the various antibiotics, with TF157B and TF218A being the isolates that showed highest susceptibility to 75.0% of the antibiotics used. All isolates were sensitive to Ceftriaxone, Ciprofloxacin, Chloramphenicol and Amikacin. It was evident that all the isolates (100%) were resistant to Meropenem; 5 out of 6 (83%) isolates were resistant to Ampicillin and Tetracycline.
**Table 1: Susceptibility pattern of *Salmonella spp* isolates**

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<thead>
<tr>
<th>Antibiotics</th>
<th>SALMONELLA ISOLATES</th>
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<tr>
<td></td>
<td>TF026A</td>
</tr>
<tr>
<td>Ampicillin</td>
<td>R</td>
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<tr>
<td>Tetracycline</td>
<td>R</td>
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<tr>
<td>Cotrimoxazole</td>
<td>S</td>
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<tr>
<td>Gentamycin</td>
<td>I</td>
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<tr>
<td>Cefuroxime</td>
<td>S</td>
</tr>
<tr>
<td>Levofloxacin</td>
<td>S</td>
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<tr>
<td>Chloramphenicol</td>
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<tr>
<td>Ceftriazone</td>
<td>S</td>
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<tr>
<td>Cefotaxime</td>
<td>S</td>
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<tr>
<td>Ciprofloxacin</td>
<td>S</td>
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<tr>
<td>Amkacin</td>
<td>S</td>
</tr>
<tr>
<td>Meropenem</td>
<td>R</td>
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</tbody>
</table>

**Susceptible (S)**

- 66.70% 75.00% 50.00% 50.00% 75.00% 66.70%

**Intermediate (I)**

- 8.30% 0.00% 16.70% 16.70% 0.00% 0.00%

**Resistant (R)**

- 25.00% 25.00% 33.30% 33.30% 25.00% 33.30%

S= Effective therapy when administered;  
R= Therapy will not be effective when administered;  
I= Therapy may fail at normal concentration but will be effective at higher concentration.

**RECOMMENDATIONS**

- Further analysis on isolated samples, such as serotyping would have been of much benefit. This was beyond the scope of the study and was unattainable due to inadequate funding. It is recommended that future studies include serotyping.

- Also, a wider study will benefit the community, as well as other communities in the KEEA district. An established surveillance system will lead to the identification of more carriers and subsequent treatment. This would reduce the number of typhoid perforations and possible future outbreaks.
REFERENCES


