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Instruction to Authors

About the Pakistan J Public Health
The Pakistan Journal of Public Health is a peer reviewed national journal published quarterly by the Health Services Academy, Islamabad, Pakistan. It will soon be abstracted/indexed both nationally and internationally. The Pak J Public Health is an open access journal which will benefit all those working in the field of public health in Pakistan.

Scope of the Journal
The Pak J Public Health accepts articles from both national and international contributors with a special emphasis on research that will have a direct impact on the practice of public health in Pakistan and around the world. The types of articles accepted include original articles, review articles and short communications. Special features will include opinion pieces, letters to the editor, education forum and students corner.

Editorial Process
The Pak J Public Health will only publish articles that have not appeared anywhere else. The review process will entail an initial review for short listing articles on the basis of relevance to public health issues, meeting minimum technical/scientific standards, having a significant public health message. Articles passing the initial short listing process will be subjected to a double blind review by at least 2 reviewers of renowned status in public health field, nationally and internationally. They will assess the articles on the basis of objectives, methodology, scientific rigor and conclusions drawn. Any queries generated during this process will be forwarded to the author/s for correction or revision by the journal editor/s. When all outstanding issues in the article have been addressed/ corrected, the final document will be subjected to a light edit for grammar, punctuation and language. The authors will be given up to a week to approve the final document for printing.

Authorship Criteria
Authorship of the articles can be claimed by those researchers who have made a major contribution in the study. Acceptable contribution would include, design & concept of study, data gathering, interpretation & analysis, article writing, proofing and/or corrections. Authors would also be expected to declare any possible conflicts of interest as well as the degree of contribution to the above mentioned criteria by each of the authors of the study. The sequence of authors once submitted will not be changed without the express consent of all authors. Furthermore, the number of authors for each study should reflect the scope of work. National level, multi site studies or those having multiple collaborating partners could have more authors than ones dealing with limited scope.

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This section would require info on any registering bodies for current RCTs/clinical trials.

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The manuscripts should be prepared in accordance with the ICMJE guidelines for manuscript submission. Before submitting a manuscript, contributors are requested to check for the latest instructions available. [http://www.icmje.org/urm_full.pdf](http://www.icmje.org/urm_full.pdf)
Articles will have to be formatted to fit Pak J Public Health criteria as follows:

1. Original research

Abstract
Abstracts of original research article should be prepared with a structured format i.e. Introduction/background, objectives, methods, results and discussion/conclusion. Authors must include 4-6 key words. Review article, Case report and other require a short, unstructured abstract. Commentaries do not require abstract. Abstract should not exceed the word limit of 300 words for original articles and the total word count not more than 3000 words, excluding the abstract and references.

Introduction
This section should include the purpose of the article. The rationale for the study or observation should be summarized; only strictly pertinent references should be cited; the subject should not be extensively reviewed. Data or conclusions from the work being reported should not be presented.

Methods
This section must include the type of study, study population, study area, study duration, details of developing tools for data collection, pre-testing, data collection, plan of analysis, ethical considerations and any other detail deemed necessary to be submitted to support the researchers’ work. References to established methods should be given, including statistical methods; references and brief descriptions for methods that have been published but are not well known should be
provided; new or substantially modified methods should be described, giving reasons for using them, and evaluating their limitations.

**Results**
These should be presented in a logical sequence in the text, tables, and illustrations. All the data in the tables or illustrations should not be repeated in the text; only important observations should be emphasized or summarized.

**Tables and figures**
Tables and figures should be kept to a minimum. Tables must be comprehensible without reference to the text. References should not be cited in the tables. Authors should indicate at approximately what point in the text the table should appear. Figures, graphs, drawings etc. should not be over complex and must be intelligible when reduced in size for printing. They should be on separate sheets, numbered and with legends.

Number tables consecutively in accordance with their appearance in the text. Place footnotes to tables below the table body and indicate them with superscript lowercase letters. Avoid vertical rules. Be sparing in the use of tables and ensure that the data presented in tables do not duplicate results described elsewhere in the article.

**Discussion**
The author’s comment on the results, supported with contemporary references, including arguments and analysis of identical work done by other workers. Asummary is not required.

2. **Review**
A comprehensive, evidence-based review of the literature relating to an important, major public health area, with a critical analysis and conclusions. The literature review methodology, including databases searched, search terms and dates, should be detailed. Reviews should normally not exceed 4000 words and should include up to three key message points.

**Reviews can be submitted on**
- Public health practice and impact
- Health service effectiveness, management and re-design
- Health protection including control of communicable diseases
- Health promotion and disease prevention
- Critique on public health programs or interventions
- Public health governance, audit and quality
- Public health law
- Public health policies and comparisons
- Capacity in public health systems and workforce
- Social determinants of health

This is not an exhaustive list and the Editors will consider articles on any issue relating to public health.

3. **Short Reports /commentaries**
Manuscripts for publication as Short Reports should be of an overall maximum length of 2000 words, including summary and references. This is equivalent to approximately four printed pages of the Journal. If Tables and/or Figures are included (maximum of one page), the text should be limited to 1500 words. The report should have a short summary, followed by a single text section that is not divided into introduction, results and discussion sections etc. (as in full papers). These should be submitted to the Journal in the same way as full papers (see Submissions).

4. **Letter To The Editor**
Letters to the editor and replies should offer objective and constructive criticism of published articles. Letters may also discuss matters of general interest to readers of Pak J Public Health and the public health community. Material being submitted or published elsewhere should not be duplicated in letters, and authors must disclose financial associations or other possible conflicts of interest. Letters should not be of more than 500 words and 5 references.

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References should be numbered consecutively in the order in which they are first mentioned in the text. Identify references in text, tables, and legends by Arabic numerals in parentheses. References cited only in tables or figure legends should be numbered in accordance with the sequence established by the first identification in the text of the particular table or figure. Use the style of the examples below, which are based on the formats used by the NLM in Index Medicus. The titles of journals should be abbreviated according to the style used in Index Medicus. Avoid citing a "personal communication" unless it provides essential information not available from a public source, in which case the name of the person and date of communication should be cited in parentheses in the text. For scientific articles, authors should obtain written permission and confirmation of accuracy from the source of a personal communication. The references must be verified by the author(s) against the original documents.
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As an option, if a journal carries continuous pagination throughout a volume (as many medical journals do) the month and issue number may be omitted. (Note: For consistency, the option is used throughout the examples in Uniform Requirements. NLM does not use the option.) Vega KJ, Pina I, Krevsky B. Heart transplantation is associated with an increased risk for pancreatobiliary disease. Ann Intern Med 1996;124:980-3.
4. Article not in English (Note: NLM translates the title to English, encloses the translation in square brackets, and adds an abbreviated language designator.) Ryder TE, Haukeland EA, Solhaug JH. Bilateral infrapatellar seneruptur hostidligere frisk kvinne. Tidsskr Nor Laegeforen 1996;116:41-2.
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11. Editor(s), compiler(s) as author: Norman IJ, Redfern SJ, editors. Mental health care for elderly people. New York: Churchill Livingston; 1996.
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We are presenting the issue four of the third volume of the Pakistan Journal of public Health with great satisfaction and a sense of achievement because of the fact that the last issue of the journal achieved the largest circulation ever achieved by this journal and that new articles, on a wide variety of key topics related to public health, have been submitted for publication in the coming issues of the journal. Also we are maintaining our policy of encourages both fresh graduates as well experienced medical and bio-medical scientists to publish their work.

The PJPH continues to highlight the public health issues spotlighted by Millennium Development Goals (MDGs), the global framework for collective action, to combat poverty, disease, environmental degradation etc. The journal also addresses key public health concern such as how to reduce the double burden of communicable and non-communicable diseases that are faced by developing countries. Due attention continues to the psycho-social aspects of health to ensure complete wellness and quality of life. A unique feature of the journal is that it continues to highlight the diversity of public health issue specially the control of vector-borne diseases which continue to emerge and re-emerge in this region.

This issue includes a paper that highlights a very important issue of increasing population of elderly in Pakistan, their nutritional status and quality of life and recommends establishment of policy and strategy to ensure quality of life of elderly people. Three papers are published in this issue that pertain to the 5th element of MDGs. One of them explores the key issues of antenatal preparedness of pregnant women at private & Public Hospitals. It points out that the Knowledge on danger signs of obstetric complications are poor and need considerable improvements . The second paper on the same theme concluded that the educational status, living standard, affordability and access to the health facility having skilled birth attendants are linked to the best practices of having a skilled birth attendant to supervise pregnancy and delivery. The other deals with safe pregnancy and delivery, the study points out to the inadequacies in availability & accessibility of important functions of BEmOC and CEmOC in remote area of Tharparkar. Persisting and re-emerging vector-borne diseases i.e. Crimean-Congo Hemorrhagic Fever among Rural Populations of Baluchistan and insecticide susceptibility monitoring in malaria vector mosquitoes in Punjab, are the themes of two publications and both emphasizes on the need for capacity building at all levels. A review on cognitive potential of children presents a very useful analysis of various interacting psycho-social and environmental factors affecting growth, cognitive or socio-emotional development of children living in poverty. THE 7th element of MDGs on "ensuring safe drinking water " is addressed by a paper presenting an improved model for predicting bacterial (Vibrio Cholera ) growth in water, after microwave irradiation, which will find useful application in ensuring microbiologically clean drinking water by determining the dynamics of such other pathogens.

We wish to thank our contributors and readers for their continued and overwhelming response and support to JPJH. As reported earlier, the Pakistan Journal of Public Health has obtained the indexation in WHO EMRO database of Scientific journals (IMEMR), Index Copernicus and EMBASE, it is in progress with Thomas Reuters, Pakistan Medical and Dental council and Higher Education Commission of Pakistan.

We wish to acknowledge our gratitude, for the members of editorial board and reviewers for ensuring the quality of publications and national and international members of Advisory Board for support and advice for continued improvement of the Journal.
A Public Health Nutritional Assessment of Elderly in Islamabad: A mixed method Study

Abdul Momin Rizwan Ahmad, Katrina Aminah Ronis

1Health Services Academy, Islamabad (Correspondence to Ahmad AMR: mominforft@yahoo.com)

Abstract

Introduction: According to the current estimates, the world’s elderly population is 605 million and by 2025, this will reach 1.2 billion. The WHO report (1998) said that at that time, the elderly population of Pakistan constituted 5.6% of the country’s total population which would rise to as much as around 11% by the year 2025. With the prolonging of life, comes the added burden of non-communicable diseases, the on-going treatment and management within a healthcare setting and within the home setting. Evidence suggests a well-nourished elderly person will maintain greater independence, i.e. they will be more physically and mentally prepared to cope with senior years. The rationale for this study is that in Pakistan, there is a dearth of data on the nutritional status of the elderly.

Methods: This study was conducted in urban Islamabad which is divided into different residential sectors. A mixed method approach was utilized: the quantitative method was a face-to-face survey (n = 300) (MNA - Mini Nutritional Assessment) and the qualitative method was a semi-structured face-to-face interview (n = 9) to provide greater insight into the survey findings. The study population included elderly males and females, over 60 years of age, as defined by the WHO. Data analysis included descriptive statistics to find the frequencies and the percentages of all the variables. Inferential statistics was used to find the cross tabulation between outcome and explanatory variables. For the qualitative data, the thematic analysis was performed manually.

Results: Of the 300 study participants, 52% (n=156) were males and 48% (n=144) were females. Cross tabulation of the socio-demographic variables and the nutritional status of the elderly revealed that there was a statistically significant relationship between age of respondents and their nutritional status however there was no statistically significant relationship between gender, sector (place of residence), education and income of respondents and their nutritional status. When the study participants were asked about their food intake and correct foods to consume, most of them had poor knowledge.

Conclusion: According to a standardized assessment tool, this study revealed that 48.7% of the elderly surveyed had a normal nutritional status, 43.3% were at risk of malnutrition, while 8% were malnourished. Accessing elderly participants to interview was a challenge and further research is needed in this field of public health due to the burgeoning population pyramid for older persons. From a policy perspective, policy makers should be sensitized to this population group with provincial health policies including the nutritional needs of our aging population as major policy goals.

Key words: Elderly, Nutritional status, Mixed method approach, Mini Nutritional Assessment.
nutritional or dietary status of the elderly population in the developing world. So public health professionals need to focus on this population group to promote, prevent, restore and maintain their health status (6).

**Methods**

This research was a mixed method approach which involved both quantitative and qualitative methods. The quantitative method was a face-to-face survey (MNA) and the qualitative method was semi-structured face-to-face interviews to provide greater insights into the survey. This study was conducted in urban Islamabad which is divided into different residential sectors and has a population of just over 1.70 million (7).

The study population included elderly males and females over 60 years of age, as defined by the WHO (8). For the MNA survey (quantitative method), the sample size was calculated as 288. For the semi-structured face-to-face interviews (qualitative method), the sample size was the point of saturation which was attained at the 9th interview. The technique of convenience sampling was used (9) that is; the study participants were selected based on their convenient accessibility and proximity.

For the semi-structured face-to-face interviews, the study participants (elderly) were selected through convenience sampling and interviewed (9). Data collection occurred in two phases. For the MNA survey (quantitative method), data was collected using the structured questionnaire known as Nestle’s Mini Nutritional Assessment Tool - Short Form (MNA-SF) which consists of 6 questions.

For the semi-structured face-to-face interviews (qualitative method), an open questionnaire for the qualitative interviews was formulated which had four questions. There were 12 variables of interest and all of them were categorical. The variables were Age, Gender, Sector, Education, Income, Food Intake, Weight Loss, Mobility, Stress, Neuro-psychological problems, BMI and Nutritional Status.

Data analysis occurred in two phases related to the two different methods utilized to collect the data. For the quantitative part, data was entered and analyzed using the software SPSS version 16.0. Descriptive statistics was used to find the frequencies and the percentages of all the variables. Inferential statistics was used to find the cross tabulation between outcome and explanatory variables (9). For the qualitative part, the analysis was done manually.

The approval for the research was undertaken by the Ethical Committee of the Health Services Academy, Islamabad. Informed written consent was taken from all those elderly who participated in the study.

**RESULTS**

**Socio-economic findings:**

A total of 300 assessments of elderly were undertaken and then the frequencies and percentages of all the 12 variables were calculated. The maximum frequency was observed in the age range of 61-70 years which was 225 while the minimum frequency was recorded in the age range of 80-90 years which was 20. Out of total 300 respondents, 156 were males and 144 were females. The maximum frequency of the respondents was seen in the sector G-6 which was 52 while the minimum frequencies were observed in sectors E-11 and G-13 which was 2. From the total sample size n = 300, two hundred and eight four respondents had an education of bachelor’s and above whilst none of the respondents were illiterate or had only primary education. Thirty seven (n=37) study participants were dependent on their partner or children for the income, that is, they had no income of their own. On the other hand, 106 participants had a monthly salary of greater than Rs, 1,00,000.

**Food intake:**

Two hundred and forty nine (n=249) respondents had no decrease in their food intake during the past three months while 22 had moderate decrease in the food intake.

**Weight loss:**

One hundred and forty four (n = 144) respondents had no deliberate weight loss during the last three months while 35 of them had weight loss between 1 and 3 kg.

**Mobility:**

All of the participants (n=300) were able to go out of their homes without the support of others.

**Stress:**

When asked about the stress during the last three months, 96 participants out of the total responded that that they had it while the remaining 204 did not have any stress.

**Neuro-psychological problems**

One hundred and seventy respondents (n = 170) had no neuro-psychological problems or severe sadness within the past three months while 46 had severe dementia or depression.

**Body Mass Index (BMI):**

The BMI of the respondents was a very important variable which was based on the weight and height of the individuals. When calculated, only 1 respondent had a BMI of less than 19 while 285 had a BMI of 23 or greater.

**Nutritional status:**

Table 1 shows the frequency and percentages of nutritional status in study population.
Table 1: Frequency and Percentage of Nutritional Status in Study Population

<table>
<thead>
<tr>
<th>NUTRITIONAL STATUS</th>
<th>FREQUENCY (n)</th>
<th>PERCENTAGE (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal nutritional status</td>
<td>146</td>
<td>48.7</td>
</tr>
<tr>
<td>At risk of malnutrition</td>
<td>130</td>
<td>43.3</td>
</tr>
<tr>
<td>Malnourished</td>
<td>24</td>
<td>8.0</td>
</tr>
</tbody>
</table>

Cross Tabulation:
The cross tabulation was conducted in order to assess the level of association between outcome and explanatory variables. Cross tabulation of the socio-demographic variables and the nutritional status of the elderly revealed that there was a statistically significant relationship between age of respondents and their nutritional status however there was no statistically significant relationship between gender, sector (place of residence), education and income of respondents and their nutritional status.

The Voice of Elderly People:
When nine (n=9) study participants were asked about their food intake and correct foods to consume, most of them had poor knowledge.

Discussion
In Pakistan there is 6.5% of the population who are 60 years and older which makes it 11.6 million at present, therefore this is a large population group for public health professionals to address in term of their overall health and wellbeing (physical, mental and emotional etc) (10). Our research assessed the nutritional status of elderly living in Islamabad. The data revealed that nearly one in two (48.7%) of the elderly surveyed and interviewed had a normal nutritional status, that is, they are neither under-nourished nor over-nourished. On the other hand, 43.3% of the elderly were at risk of malnutrition, (that is, they are prone to attain the status of either over or under nourished in the near future) whilst 8% were malnourished (that is, they are either over or under nourished) . Those elderly who were either at risk of malnutrition or were malnourished constituted 51.3% or every second study participant. These figures could be much higher for the lower socio-economic class and warrants further research to verify this.

From a public health perspective, to address 8% malnourished elderly and 43.3% who are at risk of malnutrition is a huge challenge. An important factor to be considered is that this study was conducted in Islamabad which is the capital city of Islamic Republic of Pakistan and it has the highest literacy rate in the country which approximately 87% (11). It can be argued that expanding the assessment of nutritional status of elderly into other cities and provinces of Pakistan which bring down the proportion of well-nourished elderly since other areas have less literacy rate as compared to Islamabad.

The present study was done in urban Islamabad which comprises of different residential factors. One of the important factors to be considered here is that the city of Islamabad also has different slum areas which were not touched during this study. This means is that the actual nutritional status of the elderly living in Islamabad would be somewhat different from the results of the present study.

Limitations of the Study
The major limitation of the study was that the food intake and weight loss of the respondents during the last three months were self-reported which means that either of them maybe an under or overestimate.

There was no tool used to assess the stress and neuro-psychological problems of the study participants and they may be incorrect in the self-assessment of these two variables.

Accessing the elderly was one of the major limitations of the study.

Convenience sampling was used which means that potentially there is a sampling bias and the sample was not representative of the whole population.

The results of the study cannot be generalized beyond the study participants since the sample was not representative.

Conclusion
The present study has showed that 48.7% of the elderly living in Islamabad have a normal nutritional status, 43.3% are at risk of malnutrition, while 8% are malnourished. One of the biggest findings of the study is that even with such a high level of education and a high income status of the respondents, every 1 out of 2 of them is either malnourished or at risk of malnutrition. There is a need to raise awareness concerning the nutritional needs of our elderly and the role adequate nutrition plays in “adding years to life and life to years”.

References


Birth preparedness among the antenatal clients of public and private hospitals of Bahawalpur, Pakistan

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Abstract

Introduction: Birth preparedness move a-head preparation and arrangement for delivery has been worldwide endorsed as a decisive constituent of safe motherhood program to minimize delays for care. It will help ensure that women can arrive at skilled delivery care when labor begins or in case the obstetric complications occur. This study analyzed the Birth preparedness of antenatal clients of private & Public Hospitals of Bahawalpur, Pakistan. The Objective of study was to determine awareness level of pregnant women regarding danger signs of obstetrics complication and birth preparedness & complication readiness among the women attending private and public hospital of Bahawalpur for antenatal visit.

Methods: An exit interview was conducted from 216 pregnant women by using validated, pretested adapted Questionnaire. First sample was selected by simple random sampling, for rest systematic random sampling was adapted by selecting every 7th women for interview. Ethical consideration was taken.

Results: Results of our study showed that on average women knew only two possible danger signs of obstetric complications. Bleeding/placenta Previa was the most common danger sign listed by respondents of both health facilities. Birth preparation practices were insignificant, 68.5% respondents of private and 50.9% of public hospitals identified health facility for delivery, while 48.1% of private and 56.5% public hospital's respondents had saved money for delivery. Least common arrangement was identification of blood donor and was reported by only 19.4% clients of both hospitals. Knowledge regarding danger signs of obstetric complications and birth preparedness was highly associated with education and parity i.e. women with higher level of education and multipara were more aware than uneducated and primigravida.

Conclusion: It is concluded that pregnant women who visited the private and public hospitals for antenatal checkups had limited knowledge about key danger signs of obstetric complications and hence very poor birth preparedness practices.

Keywords: Birth preparedness, Public and Private Hospitals, danger sign of obstetric complication.

(Pak J Public Health 2013; 3(4): 6-10)

Introduction

Maternal mortality is a grievous public health problem in Pakistan. According to a PDHS survey, annually 276 maternal deaths per 100,000 live births occur in Pakistan (1). The direct causes of maternal mortality are hemorrhage, infections, unsafe abortion, hypertensive diseases and obstructed labor (2). Maternal deaths are thought to occur due to three delays 1) delay to seek care 2) delay to reach proper medical services 3) delay in accessing quality care at a health care facility (3). These delays can be reduced if a pregnant woman prepares for birth and its complications. Lack of advance plan for use of a trained birth attendant for normal births, and particularly insufficient preparation for rapid action in the occurrence of obstetric complications, are well recognized factors contributing to impediment in receiving skilled obstetric care. As no action is taken earlier to the delivery, the family tries to do something only after labor begins or when emergency arise (4). The majority of pregnant women and their families do not know how to recognize the danger signs of complications when complications occur, the unprepared family will waste an enormous time in recognizing the problem, getting prepared, arranging money, finding transport and reaching the appropriate referral facility (5). Birth preparedness i.e. move a head preparation and arrangement for delivery, can achieve much to improve maternal health outcomes. Birth preparedness theory and complication readiness
includes knowing danger signs of obstetric complication, saving money, arrangement for a birth attendant and birth place, arrangement of transportation, identifying a blood donor in case of obstetrics complication. Birth preparedness has been worldwide endorsed as a critical component of safe motherhood program to diminish delays for care (6). It will help ensure that women can arrive at skilled delivery care when labor begins or in case the obstetric complications occur. Birth preparedness involves not only the pregnant woman, but also her family, community and available health staff. An accompaniment and participation of these persons can be vital in ensuring that a woman can sufficiently get ready for delivery and carry out a birth plan (7). An overwhelming majority of maternal mortality and morbidity are preventable and avoidable through well-timed access to basic maternity care supported by suitable emergency obstetric care; for which early identification of the problem at the family level is very important. For some of the complications like severe hemorrhage, a few minutes matter to save life, while for others hours or even days may be tolerable but with the prognosis getting worse as time exceed (8). Lack of money and transportation is a hurdle to seeking care as well as reaching to medical facilities . The money saved by woman or her family can pay for health services and supplies, essential for transport, or other costs that are needed in case of emergencies. Likewise, if a woman can have the funds for to pay for these costs, she is more liable to seek care (9). Preparing for birth and being ready for complications could reduce all three phases of delay and thereby positively impact birth outcomes . Birth plan should be discussed with every pregnant woman on her first antenatal visit, reviewed in subsequent visits and finalized by 32 weeks (10).

Methods

Study Design, Sample Size and Sampling Technique:
A cross-sectional comparative study was conducted between March and July 2011. Data was collected from a tertiary care level public hospital, situated in a large urban town of southern part of Punjab province, named Bahawal Victoria hospital. For comparison, a well-reputed private hospital was selected from the same town that provides round-the-clock maternity care services. Sample size was calculated to be 98 pregnant women for each group and adjusted by adding 10 percent for non-response. The resulting sample size was 108 for each group and total was 216. An inclusion criterion was all pregnant women who attended obstetric OPD of public and private hospitals for antenatal visit however the Women who presented with some obstetric complications in emergency were excluded from the study.

Data collection:
Data was collected through exit interviews by using manual of monitoring birth preparedness and complication of JHPIEGO and only woman level questionnaire were adapted from this tool. After reaching the data collection point, first woman who existed from the OPD after completion of her checkup from her doctor was selected as a first sample, for rest systematic random sampling was adopted by selecting every 7th women for interview.

Data Analysis:
After the data collection, responses for open ended questions were reviewed, and coded for computerization. Data was entered in SPSS 16 version and results were analyzed in terms of percentages and frequencies and presented as graphs and tables.

Ethical Considerations:
The study was conducted after obtaining approval from Ethical Review Board of Health Services Academy. Verbal consent was obtained from the women to be interviewed after explaining the purpose of the study. Right to refuse or leave the interview at any time was also explained to each participant before starting the interview. Confidentiality of the information provided by the participants was assured that this data is only for the research purpose and name and identification of woman is never disclosed.

Results

Socio-Demographic Characteristics:
Mean age of pregnant women was 24.03 years (±5.34) with a range from minimum 16 years to maximum 40 years in public hospitals, whereas in private hospital it was 26.13 (±4.42) years ranging from 18 to 36 years. In terms of educational status, the public hospital sample had 43% illiterate and only 6 percent had higher than secondary education while those attended private hospital 20 percent were illiterate and 34 percent had higher than secondary education. A majority (83%) of women in public hospitals sample had mean household monthly income was less than 10,000 Pakistani rupees whereas; those in the private hospital sample had only (30%) in this income group. This shows that higher income groups are more likely to use private hospitals.

Obstetric History:
Majority of women were primigravida at the time of interview that is 32.4% in public and 24.1% in private hospitals respectively. Almost 20% of study participants of both hospitals were grand multi. More than 79.6% respondents of private hospital and 50.9% of public hospital had taken their first antenatal checkup within
the first three months of pregnancy while the 19.6% respondents of public and 3.7% of private hospital had did that in last trimester of pregnancy.

Knowledge of Danger Signs Obstetric Complications: In our study 28.7% of respondents in public and 12% in private hospital were unaware of any danger sign of pregnancy. This percentage is more when asked for danger signs of labor and postpartum where 47.2 % of women in public and 57.2 % in private hospital were unaware of any danger sign of labor. 39.3% in public and 57.4% respondents of private hospital had no knowledge of the danger signs of postpartum period. Bleeding / placenta Previa was most common sign listed by respondents of both health facilities during pregnancy, labor & postpartum. (Table 1)

Source of information about Dangers signs of Obstetric Complication: Only woman who had given response they know the danger sign of obstetric complication were further asked for the source of this knowledge, more than 4/5 % of respondents told that they got knowledge of danger signs of obstetric complication by their own previous experience or observing relatives or friend’s experience. other sources of information were Doctor 6.1% followed by Mother in law 5%, other sources of information were LHW, Husband and TV/radio/internet.

Birth Preparedness:
Regarding birth preparedness 68.5% respondents of private hospital had saved money & arrangements for transportation and in public hospital 56.5% women saved the money and only 26.9% had some arrangement of transport. Least common arrangement were reported for identification of blood donor that was by 19.4 % clients of both hospitals (Figure 1).

Final Decision Holder for Silk Birth Attendant and Health Facility: The final decision holder for selection of Skilled Birth Attendant and health facility is primarily the husband with a percentile of 32.4 % of public hospital and 35.2% of private hospital respondents. While mother in law

<table>
<thead>
<tr>
<th>Danger signs</th>
<th>Pregnancy</th>
<th>Labour</th>
<th>Postpartum/Newborn</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Public %</td>
<td>Private%</td>
<td>Public%</td>
</tr>
<tr>
<td>Bleeding/Placenta Previa</td>
<td>33.3</td>
<td>41.7</td>
<td>39.8</td>
</tr>
<tr>
<td>Fetal movement</td>
<td>33.3</td>
<td>44.4</td>
<td>-</td>
</tr>
<tr>
<td>Lower Abdominal pain</td>
<td>25</td>
<td>32.4</td>
<td>-</td>
</tr>
<tr>
<td>Severe weakness/Anemia</td>
<td>31.4</td>
<td>38.8</td>
<td>-</td>
</tr>
<tr>
<td>Abnormal lie/baby Position</td>
<td>17.6</td>
<td>21.3</td>
<td>-</td>
</tr>
<tr>
<td>Vomiting</td>
<td>16.7</td>
<td>19.4</td>
<td>-</td>
</tr>
<tr>
<td>High Blood pressure/headache/convulsion/swelling</td>
<td>16.7</td>
<td>38.9</td>
<td>1.9</td>
</tr>
<tr>
<td>Polyhydromnios/Oligohydromnios</td>
<td>3.7</td>
<td>13</td>
<td>-</td>
</tr>
<tr>
<td>CPD</td>
<td>-</td>
<td>-</td>
<td>9.3</td>
</tr>
<tr>
<td>Prolong labour/not decent of head/poor dilation of cervix</td>
<td>-</td>
<td>-</td>
<td>23.1</td>
</tr>
<tr>
<td>Rupture of membrane before labor</td>
<td>-</td>
<td>-</td>
<td>12</td>
</tr>
<tr>
<td>Retained Placenta/RPOCs</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Difficulty of baby in Breathing/can’t Cry</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Others</td>
<td>16.7</td>
<td>24.07</td>
<td>-</td>
</tr>
</tbody>
</table>

*Others =IUGR + Preterm Labour + Unconsciousness + Difficulty in Breathing + Fever

![Figure 1: Birth Preparedness](image-url)
made decision for 33.3% of public and 20.4% of private hospital respondents. Whereas the respondents herself holds the decision making power with a percentile of 11.2% in public and 22.1% in private hospital respondents. Preferred Place for Upcoming Birth: 32.4% respondents form public Health facility and 28.2% from private hospital preferred home for delivery as compare to hospital.

Discussion

Socio-Economic and Obstetric Characteristics of Respondents: The result of this study has shown in socio-demographic characteristics, that access and utilization of health facility for antenatal care and delivery was associated with financial status and educational level of the clients. Women with better education and in higher income group preferred private hospitals for antenatal care and delivery. Education is found to be most relevant and highly associated with the final decision making and knowledge of the obstetric care as p-value is estimated to be (<0.001). Mushtaq et al. found almost the same association in his study as utilization of the public health facilities (74%) was associated with rural area (p=0.034) and poverty (p=0.001) while use of the private hospitals (41%) was associated with better education (p=0.002) and higher income (p<0.001) (11).

Knowledge of danger signs of obstetric complications and birth preparedness: Results showed that 50.9% of public hospital and 79.3% of private hospital respondents initiated ANC within first 3 month of pregnancy. It is in contrast with what researchers found in other developing countries where few women received it during first 3 month of pregnancy. PDHS (2006-2007) shows 31% of women make their first prenatal care visit before the fourth month of pregnancy.

The results showed that women with higher education and multigravida had more knowledge than uneducated and primigravida. Knowledge of danger signs of obstetric complications is part of birth preparedness. Awareness of danger signs enables the family and woman to take timely action when any emergency arise. Improving the quality and method of antenatal care delivery can play an important role in creating awareness regarding birth preparedness and complication readiness amongst the pregnant women. The “Three phases of Delay Model” highlights the importance of birth preparedness in prevention of maternal death by describing the sequence of events that occurs in receiving the care in case of emergency, as continuity of care starting from raising awareness about danger signs at first level facilities. The recognition of such signs at household level to access and receipt of the appropriate care of such complications at referral health facilities is crucial in reducing maternal complications (12). Result of our study shows that 28.7% of respondents in public and 12% in private hospital were unaware of any danger sign of pregnancy. This percentage is higher when asked for danger signs of labor and postpartum. Similar findings were seen in Tanzania where half of study participant and in Sudan 88.1% were not aware of any danger sign of pregnancy (13,14). It is also shown in our study that women with high level of education have more knowledge of Obstetrics danger sign. Hemorrhage is leading cause of maternal death (25%) as it is an obvious sign that can be seen by woman. Our study results shows that most of women stated vaginal bleeding during pregnancy, labour & postpartum as a danger sign of obstetric complication was followed by absent/decreased fetal movement during pregnancy, prolog labor. Hasan and Nisar reported similar finding in his study conducted in fishing community of Karachi (15). A study conducted in Gambia by Anya et al showed that 14.8% of women recognised haemorrhage as a danger sign however prolonged labour was not recognised by any woman as a danger sign (16).

The respondents from private hospital were more prepared for upcoming birth than public hospital. Most of the women (50.9%) in public & (68.5%) in private hospital had identified Health Care facility and HCP. 56.5% of women in public hospital and 48.1% in private hospital had saved some money for their delivery arrangement. About 26.5% of public and 48.1% of Private hospital respondents reported that they had arrangement of transport if they need. In other study north zone of Ethiopia shows that 78% of women had identified Health facility. 68.9% of women’s saved money which is higher than our study participants and 24.7% of respondents have identified transportation before childbirth which is lower compared to our study results (17) but in Nepal (35%) participants saved money and only 1.5% had identified transportation in base line data and its increased up to 13.9% in a follow up study (18). In Burkina Faso, 46.1% and 83.3% of respondents had a plan for transportation and saving money respectively (19). Similarly in Kenya 84.3% of respondents had set aside funds for transportation to hospital during labor. Identification of an appropriate compatible blood donor and their availability in case of an emergency may be lifesaving especially in facilities where blood is scarce. Prior donor identification may be crucial in such situations. In this study only 19.5% of the respondent in each facility had identified a blood donor. Habib et al revealed in his
study that 23.4% identified blood donor.

In our study it is also shown that women who have higher education have less preference to home delivery for their upcoming birth than who have no education. This finding is in line with another study in Ethiopia where women with high level of education were 10.6 times to use safe delivery services than with lower education level (20). In our study it is found that primigravida have less knowledge of Obstetrics complication when compared to Multigravida. This high awareness in Multigravida is due to their previous experience of complication. When asked from women about the source of information most of them replied that they had exposure to some of the complications in their previous pregnancies. Most of the women had preferred to deliver in their homes, reasons being cost, fear of C-section, previous bad behavior of doctor or staff. All of these factors are also seen in the study which is conducted in Karachi in the fishing community.

Conclusion:
Poverty, illiteracy, lack of women empowerment in decision making and poor knowledge regarding danger signs of obstetric complications are the major factors affecting planning for birth and it’s complications. Birth preparedness involves not only the pregnant woman, but also her family, community and available health staff. The support and involvement of these persons can be critical in ensuring that a woman can adequately prepare for delivery and carry out a birth plan. Antenatal counseling therefore plays a vital role in motivating the woman and her family for planning and preparing for upcoming birth by bridging the gap in knowledge regarding danger signs of obstetric complications.

References
Knowledge, Attitude and Practice of Crimean-Congo Hemorrhagic Fever among Rural Population of Baluchistan, Pakistan

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¹Directorate of Health, Government of Balochistan, Quetta, Pakistan,² Health Services Academy Islamabad, Pakistan. (Correspondence to Kumar R: ramesh@hsa.edu.pk)

Abstract

Introduction: The descriptive cross-sectional study was performed in the two districts in Baluchistan province; one with high occurrence of Crimean-Congo Hemorrhagic fever (CCHF) and the other with low occurrence of CCHF. The purpose of the study was to assess a descriptive epidemiology of CCHF, and assess the level of knowledge, attitude and practice related to the CCHF disease.

Methods: The results showed that an outbreak of CCHF in Balochistan had occurred in 1978 with 9 cases from existing data and 8 deaths with case-fatality ratio of 88%. In the 2001, 2002, 2003 number of total cases were 70, 93, 56 with 12, 10, 10 deaths respectively and case-fatality rate was reduced from 2004 because of standard measure for care at hospital in the district hospital supported by WHO.

Results: The results of the survey showed that the study population had no education. Majority of them had occupation of shepherds and the family members such as waivers daughters and sons were the one who took care of these animals. This group of population also had poor knowledge, attitude and practice in preventing themselves from CCHF disease.

Conclusion: Besides the occurrence of this study demonstrated increasing of CCHF disease with decreasing of severity. However, good practice, knowledge and attitude about this disease among population of Balochistan in Pakistan was the major concern for immediate health education program to reduce the occurrence of this preventable disease.

Keywords: KAP; CCHF; Baluchistan, Rural Population. (Pak J Public Health 2013; 3(4): 11-14)

Introduction

Crimean-Congo hemorrhagic fever (CCHF) was first described in the Crimea Congo Africa in 1944 and given the name Crimean hemorrhagic fever (1). CCHF manifests itself as a severe disease in humans, with a high mortality rate despite of modern intensive medical care. Fortunately, human illness occurs infrequently, although animal infection may be more common. The virus is spread through its tick vector and is endemic in many countries in Africa, Europe and Asia, and during 2001, their outbreaks have been recorded in Kosovo, Albania, Iran, Pakistan, and South Africa (2). This disease was also endemic in Pakistan, where different ecological factors provide opportunities for the virus to stay and thrive. Outbreaks of CCHF were confirmed in 1987, 1994, 1995, 1998, and 2000 and in 2001 in various parts of the province of Baluchistan. Domestic animals like cattle, sheep and goat are commonly the source and reservoir for this virus, these animals become infected from the bite of infected tick (3). The humans may acquire this infection through bite of an infected tick, during family outbreaks, slaughtering or manipulating the blood of infected animals. Body secretions and blood of patient is infectious and causes nosocomial spread to health care workers and patient attendants. The incubation period in case of tick bite is commonly 1-3 days to the maximum of 9 days. In case of person-to-person spread incubation period is 5-6 days, maximum being 13 days. There is a wide range of symptoms. Commonly sudden onset of high-grade fever, headache, and dizziness, flu like symptoms, nausea, abdominal pain, and muscle aches is followed by generalized bleedings and in severe cases vascular collapse and shock (4). The importance of viral hemorrhagic fever in health has been well known, particularly in relation to the possibility of cross infection between patients and the occupation risk to doctor’s nurses and the paramedic staff. CCHF is an endemic tick-borne viral disease and out breaks occur mainly in the cold, arid regions of Pakistan. Between 1976 and 2000 about 101 cases of CCHF were reported with mortality rate as high as 40%. In Balochistan, Pakistan, out-break of CCHF has been reported for several years, especially in
district loralai and killa saifulah located in Zhob division. Government has responded by arranging quarantine for infected cases, arranging medical teams, implementing active surveillance and raising community awareness through mass media and local health campaigns. However, no study has been done to assess the knowledge, attitude and practice of communities living in endemic areas with standard control program. This research was about to conduct KAP survey to address this gap to evaluate standard control program by KAP survey.

Methods
The cross sectional study was conducted from January to March 2010 in two villages of districts Loralai and Killa Saifullah in Baluchistan province, Pakistan. The shepherds, livestock keepers and farmers were interviewed.

A total of 212 respondents were interviewed. This sample size was calculated formula for the estimation of sample size for simple random sampling. The sample was equally divided to be taken from each of the village. Systematic sampling was used to select households. Every 5th house was selected through this method. When we found no eligible person in the household at the time of survey, the next house was selected.

Interviews were conducted through a semi-structured questionnaire and field guide which were translated into Pashtu language which the residents of both the areas spoke. Data collectors were trained before data collection process. Respondents who had any mental disability were excluded from the study. Respondents were interviewed after obtaining the written and informed consent. The response rate was 100 % of shepherd livestock keepers and farmers living in both areas.

Results
Data was analyzed though Statistical package for social sciences (SPSS) version 18. Socio-demographic characteristics for both villages are given in table 1. Gender ratio was unequal in study as males were found to be the shepherds in most cases therefore 96% of the respondents were males and 4% were females. Results showed that in Loralai, 59% of sampled respondents were in the age group of between 40-60 years. While in district killa saifullah 61% was less than 40 years of age group. It was found that all the respondents from both the villages were not educated

<table>
<thead>
<tr>
<th>Variables</th>
<th>Village in Loralai (n=106)</th>
<th>Village in Killa Saifullah (n=106)</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;40</td>
<td>35(39%)</td>
<td>55(61%)</td>
<td>0.008</td>
</tr>
<tr>
<td>40-60</td>
<td>70(59%)</td>
<td>48(41%)</td>
<td>0.010</td>
</tr>
<tr>
<td>&gt;60</td>
<td>1(25%)</td>
<td>3(75%)</td>
<td>0.124</td>
</tr>
<tr>
<td>Mean ± SD</td>
<td>44.38</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex of the Interviewee:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>102</td>
<td>104</td>
<td>0.040</td>
</tr>
<tr>
<td>Female</td>
<td>4</td>
<td>2</td>
<td>0.051</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Daily wages Worker</td>
<td>0</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Farmer</td>
<td>13(81%)</td>
<td>3(19%)</td>
<td>0.112</td>
</tr>
<tr>
<td>Livestock keeper</td>
<td>1(100%)</td>
<td>0(0%)</td>
<td>0.301</td>
</tr>
<tr>
<td>Sheppard</td>
<td>90(47%)</td>
<td>102(53%)</td>
<td>0.122</td>
</tr>
<tr>
<td>Butcher</td>
<td>2(100%)</td>
<td>0(0%)</td>
<td>0.014</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>1(100%)</td>
<td></td>
</tr>
<tr>
<td>Number of children</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0-3</td>
<td>20(32%)</td>
<td>43(68%)</td>
<td>0.001</td>
</tr>
<tr>
<td>4-6</td>
<td>82(59%)</td>
<td>56(41%)</td>
<td>0.012</td>
</tr>
<tr>
<td>7-11</td>
<td>4(36%)</td>
<td>7(64%)</td>
<td>0.510</td>
</tr>
</tbody>
</table>

The study showed that all families in these two areas had animals at home, it was a tradition and also a major source of dairy foods and income. The majority of animals in these areas were sheep, goats, cows and buffaloes. Most, 82%, had goats in their houses. The animals were mostly looked after by sons, daughters or wives of the respondents; there was no statistically significant difference with that regard in both the villages (Table 2).

<table>
<thead>
<tr>
<th>Variables</th>
<th>Village in Loralai n=106</th>
<th>Village in Killa Saifullah n=106</th>
<th>p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kind of animals at home</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cows/Buffalo</td>
<td>19(56%)</td>
<td>15(44%)</td>
<td>0.451</td>
</tr>
<tr>
<td>Goats/sheep</td>
<td>85(49%)</td>
<td>89(51%)</td>
<td>0.121</td>
</tr>
<tr>
<td>Chicken/ducks</td>
<td>2(67%)</td>
<td>1(33%)</td>
<td>0.101</td>
</tr>
<tr>
<td>Others</td>
<td></td>
<td>1(100%)</td>
<td></td>
</tr>
<tr>
<td>Animal keeper in family</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wife</td>
<td>14(40%)</td>
<td>21(60%)</td>
<td>0.134</td>
</tr>
</tbody>
</table>
In the knowledge related to CCHF, people were asked about causative agent, incubation period, mode of transmission, signs, symptoms and treatment. All of the interviewed population had not heard about CCHF. The highest score of knowledge related CCHF was 11 and the lowest was 0 to 6. In the attitude, the respondents were asked about attitude towards transmission of CCHF and personal protective practice in the house. The maximum score was 21. The total score 18 or above was considered good and score 17 or less was consider not good. Question which explored preventive behavior about CCHF, included inquiries to personal protective practice and practice of using infection control in population. All the population had low level of preventive behavior. Both populations were not routinely using any chemicals to control ticks and did not practice to examine their clothes and skin for the ticks regularly in case they handled animals. Also during the epidemics of CCHF they did not avoid eating meat. If found, all communities squeezed the ticks from their bodies. All of the population could not treat domestic animals for the ticks and accessibility to veterinary service was negligible in rural areas. Both communities had no knowledge that if human could be infected with CCHF from direct contact with infected tissues or blood from live stock. About important symptoms and becoming symptomatic, all respondents were not aware, about severity of CCHF case.

The attitude towards CCHF in both populations was poor. All agree that they could not do anything about CCHF; they rather believed that it was all in the hands of God. The study found no statistically significant difference between Knowledge attitude and practice in both villages.

Discussion
Considering attitude towards CCHF, this study showed that all of the rural population had low level of attitude. Association among various general characteristics and knowledge, attitude and preventive behavior on CCHF had no significant difference of mean score of knowledge related to CCHF among both village populations. Also there was no significant difference of mean score of preventive behavior on CCHF among gender, education and occupation.

Main reason that the rural population did not know about CCHF might be that individuals being interviewed had never seen a patient in the immediate community. Similarly the CCHF cases appear rarely and so the health department also lack firth and experience of the disease, there for the preventive measures of both people and the health department are inadequate and delayed (5). Majority of the respondents were Shepherds and belonged to young age group which is the most vulnerable group to develop CCHF. Other studies reported that CCHF cases are mostly seen in shepherds and abattoir workers (6). Majority of the respondents had sheep and goats and were not routinely using chemicals to control tick when they looked after the animals. This is due to poverty and main cause of migrations people migrate from neighboring country and which is drastically increasing day by day.

Study was conducted to determine the KAP among healthcare workers in Balochistan mentioned that occupation influenced difference behavior and the respondents had a poor knowledge towards CCHF. Hence, that study also supports our findings (5).

There is need to educate healthcare workers and at risk populations, hematological support, anti-viral drugs, and barrier nursing that might help in reducing mortality due to this disease (7). Research suggests that in the absence of an effective vaccine, prevention is based mainly on vector control, protection measures, and information to increase the awareness of the population and of healthcare workers is important (8).

Conclusion
There was no significant difference of mean score of knowledge, attitude of for various general characteristics like gender, education and occupation and no significant of mean scores on preventive behavior about CCHF among gender, education and occupation among the populations from both the villages.

Ethical consideration: ethical approval was taken from Health Services Academy Islamabad, government of Pakistan.

References


Introduction

Malaria is a mosquito-borne parasitic disease that is common in the world's poorest countries. It is preventable and treatable, yet it still kills millions of people every year in rural and poor populations because they have little or no access to current prevention and treatment tools (1). In 2011, 99 countries had ongoing malaria transmission, approximately half of the world’s population is at risk of malaria and most cases and deaths occur in sub-Saharan Africa, especially among children where a child dies every minute from malaria. However, Asia, Latin America, and to a lesser extent the Middle East and parts of Europe are also affected (2).

Based on the reported data in 2011, estimated 46% of the population of Eastern Mediterranean Region (EMR) is living in areas with risk of local malaria transmission (3). In EMR, Pakistan, Somalia, Sudan and Yemen whereas in the South-East Asia Region, Bangladesh, India, Indonesia and Myanmar have persistently high malaria burden. In 2010, four countries accounted for 97% of the confirmed cases which were Sudan (58%), Pakistan (22%), Yemen (10%) and Afghanistan (6%) (4).

Malaria is the second most prevalent and devastating disease in Pakistan. According to WHO in 2009 the confirmed cases of malaria were only 104,454, of which 70% were due to Plasmodium vivax and 30% to Plasmodium falciparum, two prevalent malaria parasite species in Pakistan (5). Malaria has a tendency for epidemic outbreaks over larger area, particularly in Baluchistan, KPK and Sindh province and is now emerging as a prominent health problem in FATA. In 2011, the total number of confirmed malaria cases in Pakistan (public sector), reported from all the districts were 319,592. In Pakistan, out of total 24 Anophelines there are two major vector species named Anopheles culicifacies and Anopheles stephensi, (6) but around the world there are about 380 species of Anopheles with 60 species to act as vectors of malaria (7).

Vector control is an important part of the global malaria control strategy. Current malaria vector control uses insecticides from four chemical classes: Pyrethroids, Organochlorines (including DDT), Organophosphates (OPs), and Carbamates (8), but vector control is highly dependent on the Pyrethroids, due to its rapid and durable effect and its low toxicity and cost. Vector control can be less effective by Anopheline mosquitoes developing...
resistance to insecticides used in IRS and ITNs (4).

In the world DDT (Dichloro-Diphenyle Trichloroethane) was first introduced for mosquito control in 1946 and within a year DDT resistance occurred in mosquitoes. Since then more than 100 mosquito species with more than 50 Anopheles are reported as resistant to one or more insecticide. The development of Pyrethroid resistance in An. gambiae is reported by the WHO and other organizations on the use of Pyrethroid-impregnated bed nets for malaria control (9). In recent years, mosquito resistance to Pyrethroids has emerged in many countries to all four classes of insecticides used for public health. Sub-Saharan Africa and India are characterized by high levels of malaria transmission and widespread reports of insecticide resistance (2). Pyrethroids need to be ‘protected’ through judicious use and through rotation amongst the four classes of insecticides that can be used for IRS (10). Malaria vectors have also acquired widespread resistance to many of the currently used insecticides, including synthetic Pyrethroids. Hence, there is an urgent need to develop alternative insecticides for effective management of insecticide resistance in malaria vectors (11). The two primary malaria vectors in Pakistan An. stephensi and An. culicifacies have developed resistance to insecticide of chlorinated hydrocarbon group such as DDT and Dieldrin in neighboring countries such as Iran, Afghanistan, Iraq, Saudi Arabia, India and these species developed resistance to Malathion in Iran. In Pakistan resistance to previously used Organophosphates (Malathion, Fenitrothion), Carbamates (Propoxur) and Organophosphates (Malathion, Fenitrothion) has been well documented (5).

In order to ensure a timely and coordinated global response to the threat of insecticide resistance, WHO has worked with a wide range of stakeholders to develop the Global Plan for Insecticide Resistance Management in malaria vectors (GPIRM), which was released in May 2012. The GPIRM puts forward a five-pillar strategy calling on the global malaria community to plan and implement insecticide resistance management strategies in malaria-endemic countries (12). Keeping in mind the Global Plan for Insecticide Resistance Management in malaria vectors (GPIRM), timely entomological and resistance monitoring will help to plan effective malaria control programme, this study was based on that plan.

In order to develop an appropriate and comprehensive response to resistance development in malaria vectors, there is an urgent need to review the current status of insecticide resistance in malaria vectors, and to identify options for a resistance management strategy that could help to preserve insecticide susceptibility, slow down the evolution of resistance, and prolong the effectiveness of current vector control interventions (13).

Insecticides play an important role in vector borne diseases control. Different chemicals are applied to control malaria vector but development of resistance to the insecticides lead to problem in their use. Changing trends of resistance in target vectors need to be assessed against different insecticides, which have previously used for vector control as well as those that are currently being used. The resistance against different groups of insecticides can be tested with available WHO test kits. Susceptibility / Resistance status of Anopheles mosquitoes has not yet been established in Gujrat district so this study was planned to find the Susceptibility/ Resistance status of Anopheles mosquitoes against different groups of insecticides. This study provides baseline data of Susceptibility/ Resistance status of Anopheles mosquitoes against different groups of insecticides and will provide evidence base information for planning an effective mosquito control strategy in district Gujrat, Punjab, Pakistan.

Methods
A cross sectional descriptive study was conducted in randomly selected localities of district Gujrat, Punjab, Pakistan from January to June 2013. Mosquitoes were collected from animal sheds and human dwelling in the morning from 06.00 to 8.30 am using mouth aspirators and mechanical (CDC) sweeper machine. Female mosquitoes of all stages, including fed, half-gravid, and gravid, were collected from the following four sentinel sites (Fig. 1) of district Gujrat, Punjab Pakistan: Kot Mojdin; (KMD), Gumti; (GUM), Sambli; (SAM), Mandiala; (MAN). Minimum of 100 mosquitoes were used in 4-5 replicates with 20-25 females per tube / replicate for each insecticide concentration / dosage. Two controls were used for each test (According to WHO test procedures).

Standard WHO adult test kits were used. The mosquitoes were exposed to the discriminating doses recommended by WHO, test papers impregnated with 0.05% Deltamethrin, 0.05% Lambda-cyhalothrin, 0.75% permethrin, 4% DDT, and 5% Malathion were used, with one hour exposure period. Water was provided during the 24-h holding period, after which mortalities were calculated. Temperature was recorded as 230C-270C, and humidity was 70-85% during the recovery period. At the end of recovery period which is after 24 hours, mosquitoes which were killed by different insecticide
impregnated papers and also those killed in the control tube were counted. These all test were made under field conditions. Two controls were run in all cases. Normally there were no mortalities in the controls, but in cases where 5–20% mortalities were observed in controls, corrected percentage mortalities were calculated using Abbott's formula.

Criteria for interpreting the results of the WHO bioassay have been revised in light of new knowledge and the need for prompt action to counter the spread of resistance among vector populations. According to new criteria, a mortality in the range 98–100% indicates susceptibility, mortality is between 90% and 97%, indicates the presence of resistant genes in the vector population which must be confirmed, whereas less than 90% mortality indicates confirmed existence of resistant genes in the test population (14).

Data was entered in SPSS_16 software and analysed to calculate the chi-square and p.value to find the level of significance of tests and homogeneity in mosquito populations from different localities.

Results

Anopheles stephensi was exposed to various diagnostic doses of three Pyrethroids (Deltamethrin, Lambda-cyhalothrin, and Permethrin), one Organophosphate (Malathion), and one Chlorinated Hydrocarbon (DDT), showed a range of mortalities in various localities of district Gujrat. Anopheles stephensi was resistant to all five insecticides.

As described in Table1, results of test done on Anopheles stephensi, against diagnostic dose of 4% DDT which belongs to chlorinated hydrocarbon showed resistance in all four localities with percentage mortality ranged from 30% to 46%. Malathion belongs to group of organophosphate. The results of test done on, Anopheles stephensi, against 5% Malathion showed mortality that ranged from 50% to 64% and Anopheles stephensi is resistant to 5% Malathion. Next three insecticides belong to Pyrethroid group. Test results against 0.05% Deltamethrin diagnostic dose showed complete resistance in all four localities in Anopheles stephensi with percentage mortality ranged from 50% to 63%. Wild caught female Anopheles stephensi showed percentage mortality ranged from 57% to 69% and show resistance at all four localities against 0.05% Lambda-cyhalothrin while against 0.75% Permethrin Anopheles stephensi were resistant with percentage mortality ranged from 55% to 68% in all four localities.

Chi-square tests were performed to compare populations collected from different locations for heterogeneity. At least five replicates of each were made from nearly all locations.

Discussion

Malaria in Pakistan still persists in the southern part of the Punjab province, and Plasmodium falciparum dominates the northern part of the country with high mortality and morbidity rates. The southern districts of Punjab were recently affected by floods, which created large exposure to malaria vector mosquito bites, and consequently have an increased likelihood of contracting malaria (15). In the late 1970s, the Punjab province faced malaria control failure due to undetected resistance to DDT and Malathion, which were in use at that time. Due to this history, the judicious use of pesticides, supported by appropriate insecticide resistance monitoring in Punjab has assumed top priority, particularly for Pyrethroids, which are presently not only used for public health, but are also used in large quantities for agricultural purposes. Such a situation calls for intensive monitoring and surveillance of resistance in insect vectors.

The results of the present study were compared with the results of previous studies in which resistance to DDT and Malathion was first recorded 33 years ago in Punjab Province (16,17). In the present study we noted that in district Gujrat, An. stephensi remained resistant to DDT and Malathion, and there was no sign of reversal of resistance. This was despite the fact that the use of both pesticides for malaria vector control has been discontinued for nearly two decades. The evidence for the disuse of both DDT and Malathion for malaria vector control is provided by the official report of The Directorate of Malaria Control of Pakistan (18). According to the report the use of DDT.
for malaria vector control in Pakistan started in 1961 and stopped in 1979. Malathion was used from the early 1980s to mid-1990. Due to the development of resistance to Malathion, the use of Malathion was discontinued in 1996, and it was replaced by Deltamethrin, which is still being used. This shows that the end of the use of DDT and Malathion for malaria vector control was stopped 33 and 16 years ago, respectively. Normally it is expected that discontinuation of the use of a pesticide may result in reduction of insecticidal selection pressure on the vector mosquitoes, and may lead to the reversal of resistance. However, resistance to some Pyrethroids is slowly developing in some districts, for example to Permethrin, Lambda-cyhalothrin, and Deltamethrin (19).

A study on Pesticide susceptibility status of Anopheles mosquitoes in four flood-affected districts of South Punjab, Pakistan showed that Anopheles stephensi remained resistant to DDT and Malathion with three commonly used Pyrethroids, Permethrin, Lambda-cyhalothrin, and Deltamethrin, detected resistance in the majority of cases (15). The results of a study showed first indication of Pyrethroid resistance in An. stephensi with widespread, multiple resistances to Organochlorines and some report of tolerance to Organophosphate insecticides and recently to Pyrethroids in a malarious area, from Southern Iran (20). The results of the susceptibility tests in a study in India revealed that An. stephensi has developed resistance to DDT and Malathion but still was found totally susceptible to Deltamethrin (21). Fonseca I, et al. in 2009, studied Pyrethroid and Organophosphates resistance in Anopheles populations from malaria endemic areas in Colombia (22). However, with appropriate resistance-management strategies, the development of high levels of resistance can be prevented or delayed. The results of this study will provide a clue for monitoring and mapping of insecticide resistance in the malaria vector and an important evidence base for strategic planning for vector control.

Table No.1: Summary of results of Susceptibility/Resistance tests done on An. stephensi, with 4% DDT, 5% Malathion, 0.05% Deltamethrin, 0.05% Lambda-cyhalothrin, and 0.75% Permethrin in district Gujrat.

<table>
<thead>
<tr>
<th>District</th>
<th>DDT</th>
<th>Malathion</th>
<th>Deltamethrin</th>
<th>Lambda-cyhalothrin</th>
<th>Permethrin</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Status</td>
<td>Status</td>
<td>Status</td>
<td>Status</td>
<td>Status</td>
</tr>
<tr>
<td>KMD</td>
<td>45.61</td>
<td>61.06</td>
<td>59.32</td>
<td>64.34</td>
<td>60</td>
</tr>
<tr>
<td>GUM</td>
<td>30.17</td>
<td>63.55</td>
<td>63.02</td>
<td>67.79</td>
<td>67.54</td>
</tr>
<tr>
<td>SAM</td>
<td>36.28</td>
<td>56.07</td>
<td>55.46</td>
<td>69.15</td>
<td>57.89</td>
</tr>
<tr>
<td>MAND</td>
<td>31.7</td>
<td>50.42</td>
<td>50</td>
<td>56.89</td>
<td>54.78</td>
</tr>
<tr>
<td>Total</td>
<td>466</td>
<td>455</td>
<td>478</td>
<td>469</td>
<td>464</td>
</tr>
</tbody>
</table>

Chi square

<table>
<thead>
<tr>
<th>DDT</th>
<th>Malathion</th>
<th>Deltamethrin</th>
<th>Lambda-cyhalothrin</th>
<th>Permethrin</th>
</tr>
</thead>
<tbody>
<tr>
<td>p= 0.063, df= 3, x²= 7.280</td>
<td>p= 0.184, df= 3, x²= 4.836</td>
<td>p= 0.206, df= 3, x²= 4.572</td>
<td>p= 0.201, df= 3, x²= 4.635</td>
<td>p= 0.163, df= 3, x²= 5.124</td>
</tr>
</tbody>
</table>

S= Susceptible if 98-100% observed mortality
? = 90-97% observed mortality suggests the possibility of resistance that needs to be further confirmed.
R= Resistant if < 90% observed mortality
R1-R5= Replicates, C1-C2= Control
Level of Significance p<0.05; non-significance p>0.05, df= Degree of freedom, χ²= Chi Square Value
KMD= Kot Mojdin; GUM=Gumti; SAM=Sambli; MAND,=Mandiala.
Conclusion
This is the preliminary survey of insecticide resistance/susceptibility of *Anopheles* species in District Gujrat. Insecticide resistance was observed in malaria vector species *Anopheles stephensi* against 4% DDT, 5% Malathion 0.05% Lambda-cyhalothrin 0.05% Deltamethrin and 0.75% Permethrin according to WHO interpretation. This survey generates record of different species of *Anopheles* in the district Gujrat. It provide evidence base data on insecticide resistance, which enable to follow trends in susceptibility status in this area and will also serve as a base for resistance management interventions. In view of the present status of the resistance in disease vector, the development and implementation of comparatively new strategies for integrated vector management (IVM), needs to be planned in light of the data of this study. In order to manage, prevent, or slow the development of resistance to the presently used effective insecticides, a strategic approach for the judicious use of pesticides is essential. This approach requires efficient and regular monitoring of the susceptibility status of disease vectors as an important component of IVM. Unfortunately, pesticide resistance monitoring and surveillance is extremely inadequate in Pakistan. An effective resistance management policy is not possible without the strong evidence obtained from monitoring and surveillance. Further research is needed to confirm the role of *Anopheles* species in malaria transmission and to monitor the trend of insecticide resistance in malaria vectors. Genetic/molecular studies required for the isolation of resistant genes in prevalent vectors is also recommended to confirm the findings of this survey.

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13. WHO HEADQUARTERS, GENEVA, Global Malaria Programme, Meeting report, The technical basis for coordinated action against insecticide resistance: preserving the effectiveness of modern malaria vector control. 4–6 May 2010; p1
16. Rathor HR and Toqir G. Selection for DDT- susceptibility in Anopheles culicifacies from Lahore, Pakistan.1980 ; 11 (1)
Still how far to reach: Situational analysis of Emergency obstetric care facilities in Tharparkar, a far reached district of Pakistan

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Abstract

Introduction: Maternal death is not only a tragedy for a family but it is failure of healthcare system and health policy of a country because it is a joint responsibility of global health community. Maternal mortality is still high in Pakistan. Increasing availability & accessibility to Emergency obstetric care (EmOC) services is the key to this problem. The objective of the study was to assess the availability & accessibility of six signal functions of EmOC & eight signal functions of Comprehensive Emergency Obstetric Care in district Tharparkar

Methodology: This descriptive study used situation analysis approach for assessment of EmOC services at total 8 obstetric care providing public health facilities from April to June 2011. The data on primary and secondary data on pre-tested questionnaire and quick EmOC facility assessment checklists as well as interviewing the incharge of facility. Questionnaire was designed as per International Standard questionnaire using recommended UN process indicators for EmOC. SPSS version 16 was used to analyze the data. Descriptive statistics e.g. Frequencies and percentages were calculated for district Population, staff, their availability, medicine/ Equipment.

Results: Despite of required 2 comprehensive and 10 basic EmOC facilities there was only 1 comprehensive (Mithi) and 7 basic EmOC facilities [Chhachhro Taluka (2), Diplo Taluka (2) & Nagarparkar Taluka (2) Mithi Taluka (1) available in district Thaparkar. At all facilities, the UN process indicators were below the minimum recommended. Minimum distance required to reach a BEmOC or CEmOC is 1 to 2 Kilometers while maximally it was upto 90 Kilometers with a median distance of 30 Kilometers. In case of referral to higher facility, this distance still increased upto 160 Kilometers with a mean of 41 Kilometers.

Conclusion: The district is in acute and utmost need of strengthening the district health system and provision of more resources with emphasis on maternal health

maternal and child health (NMNCH) program (9, 10). It was designed to improve the accessibility of high quality and effective maternal-child health (MCH) services for all, particularly the poor and disadvantaged, at all levels of the health care delivery system. Despite of intense effort the basic health indicators like MMR, IMR are still at quite high levels. According to PDHS 2006-07, MMR was 276 per 100,000 live births (11) which attributed to low skilled birth attendance rate, high fertility and above all insufficient access to emergency obstetric care (EmOC) services. There has been an increase in the skilled birth attendants from 43% in 2001 to 61% in 2006-07 and to 73% in 2012-13 with a slight decrease in the maternal mortality in Pakistan (12). Further delivery by skilled birth attendant has risen from 39% to 52% and deliveries taking place in a health facility increases from 34% to 48% in 2012-2013 which are not up-to mark (12), creasing availability & accessibility to EmOC services is the key to this problem. Emergency obstetric care is a set of eight signal functions. Series of these functions is performed in health facility to save mother’s life. According to Columbia University, school of public health (pioneers in research on maternal mortality, the best and most cost effective strategy for reduction in maternal mortality is to provide EmOC services round the clock (24/7 EmOC) within the reach of all pregnant women (5, 13).

Evidence from data shows a close ecological correlation between the availability of emergency obstetric care services and reduction in maternal mortality. Reduction of maternal mortality rate from 546 in mid of 19th century to only 39 maternal deaths per 100,000 live births in 1960 in England and Wales was due to availability and reach of women to EmOC services (14, 15). Recently, Honduras, Bangladesh, Egypt etc brought decrease in MMR by enhancing EmOC services (16-18). Basic EmOC is presence of first 6 functions while in comprehensive EmOC there is addition of last 2 functions (19). By providing EmOC services on time to those women who are in need, 75% of maternal mortality can be prevented (6, 19).

Jafarey et al. (3) and Ali et al. (20) found that secondary level facilities in Pakistan are frequently unable to provide 24/7 EmOC service, or are of poor quality with inadequate human resource. While the geographic accessibility to EmOC was at travel of >30 Kms to >60 Kms minimum at certain areas of both provinces (Panjab & KPK). It was found that, by whatever vehicular means of transportation was available, the median time required to reach a referral hospital providing comprehensive EmOC from a hospital providing only basic EmOC was 45 minutes (q1-q3: 20-60 minutes) in NWFP and 60 minutes in Punjab (q1–q3: 30–90 minutes) (20). The condition can be assumed to be severe in far situated areas of Sindh as well. One such area is Tharparkar which is very remote and far located district of Sindh. Most of the population is poor and lives hard life. The terrain is deserted and the district is underdeveloped overall. Only Taluka headquarters and a head quarter at Mithi have some basic facilities of life. Population lives in collections of 20-30 houses at distance ranging from 5 Kms to 50 Kms. These population pockets are scattered all over the district without any health facilities near to them, while access to nearest facility i-e; Taluka headquarter is very difficult. Private taxi is the only and much expensive transport method. Most of population especially women are illiterate do not know about safe motherhood. Moreover the cultural practices of home delivery are prevalent and continue to endanger the lives of women.

Antenatal coverage in district Tharparkar is 29%, skilled birth attendance 16% and use of modern contraceptives is 21% (21). All these indicators are well below the data of Pakistan in general which reflects the underdevelopment of the area. The current study aimed to assess the availability & accessibility of six signal functions of Basic Emergency Obstetric Care & eight signal functions of Comprehensive Emergency Obstetric Care in district Tharparkar.

Materials and methods

This descriptive study used situation analysis approach for assessment of EmOC services at total 8 obstetric care providing public health facilities from April to June 2011. There was only one (DHQ hospital) which was a CEmOC facility and rest of seven facilities 3 were THQs, 2 RHCs & 2 Maternity centers were entitled as BEmOC facilities. Facilities not providing EmOC services were excluded. Principle investigator collected the data on primary and secondary data on pre-tested questionnaire and quick EmOC facility assessment checklists as well as interviewing the incharge of facility. Questionnaire was designed as per International Standard questionnaire using recommended UN process indicators for EmOC (22).

SPSS version 16 was used to analyze the data. Descriptive statistics e.g. Frequencies and percentages were calculated for district Population, staff, their availability, medicine/ Equipments etc. Frequency table, bar graphs and pie charts are used to display data.

Definitions of UN Process Indicators (22):

Availability of EmOC: Number of facilities that provide EmOC per 500,000 population.
Proportion of all births in EmOC facilities: Proportion of women with obstetric complications delivered at EmOC facilities.

**Met need:** Proportion of women with obstetric complications delivered at EmOC facilities; Cesarean deliveries as a proportion of all births: Cesarean deliveries as a proportion of all births; Case fatality rate: proportion of women with serious obstetric complications admitted to a facility who die.

Crude Birth Rate: estimated at 40.6 per 1,000 population, translating to 126,544 births for Multan.

**Results**

As per UN EmOC indicators recommendation, for population of Tharparkar (>1.2 million in 2011) (21), there was need of at least 2 comprehensive and 10 basic EmOC facilities. BEmOC facilities number still required more due to spatial distribution of population. There were only 1 comprehensive (Mithi) and 7 basic EmOC facilities [Chhachho Taluka (2), Diplo Taluka (2) & Nagarparkar Taluka (2) Mithi Taluka (1)] available. At all facilities, the UN process indicators were below the minimum recommended. (Table 1).

Minimum distance required to reach a BEmOC or CEmOC is 1 to 2 Kilometers while maximally it was upto 90 Kilometers with a median distance of 30 Kilometers. In case of referral to higher facility, this distance still increased upto 160 Kilometers with a mean of 41 Kilometers. Civil Hospital Hyderabad which is referral hospital for DHQ Mithi is at 1.5 times more distance than DHQ Mithi itself to its referred facilities locally. (Table 2) It was worth noting that 66.67% health facilities had functional ambulances for emergency patient transportation. (Table 3)

There were only 3 sanctioned posts for Gynecologists in district. On other hand only one Gynecologist was posted i.e at DHQ (Civil hospital Mithi), who was working as 24/7 basis and enabling this facility to nominate as actually working emergency obstetric care facility while rest of 75% of CEmOC facilities were lacking the qualified Gynecologist. Although LHVs, Midwives & Dais availability was between 60% & 87%.

District Head quarter hospital was largest staffed among all facilities and also had all the basic necessities while RHC Kheensar and Maternity centre Chhachho are least staffed and least facilitated facilities. Both of these are in Taluka Chhachho which is largest and populous Taluka of the district but least developed and ignored. Overall there was almost 23% absenteeism in EmOC services facilities.

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### Table 1: The UN process indicators for District Tharparkar 2011.

<table>
<thead>
<tr>
<th>UN Process Indicator</th>
<th>Recommended Level</th>
<th>District Tharparkar</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Availability of EmOC services</td>
<td>1 comprehensive/500,000 4 basic/500,000</td>
<td>1 (2) 7 (10)</td>
<td>Below recommended</td>
</tr>
<tr>
<td>Proportion of all births in EmOC facilities</td>
<td>&gt;15%</td>
<td>6.64%</td>
<td>Below recommended</td>
</tr>
<tr>
<td>Met need for EmOC services</td>
<td>100%</td>
<td>11.04</td>
<td>Below recommended</td>
</tr>
<tr>
<td>Cesarean sections as a percentage of all births</td>
<td>5-15%</td>
<td>2.38</td>
<td>Below recommended</td>
</tr>
<tr>
<td>Obstetric case fatality rate (CFR)</td>
<td>&lt;1%</td>
<td>4.50</td>
<td>Above recommended</td>
</tr>
</tbody>
</table>

### Table 2: Geographic accessibility of EmOC facilities in Tharparkar to its covered population and to its referral facility. (UN process indicator-2)

<table>
<thead>
<tr>
<th>N=8</th>
<th>Area in Kms served by health facility</th>
<th>Nearest living covered population at distance (Kms)</th>
<th>Farthest living covered population at distance (Kms)</th>
<th>Distance to the referral health facility (Kms)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Median</td>
<td>2735</td>
<td>1</td>
<td>30</td>
<td>41</td>
</tr>
<tr>
<td>Minimum</td>
<td>560</td>
<td>1</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Maximum</td>
<td>6399</td>
<td>2</td>
<td>90</td>
<td>160</td>
</tr>
</tbody>
</table>

### Table 3: EmOC services related staff strength in health facilities of Tharparkar.

<table>
<thead>
<tr>
<th>Name of Post</th>
<th>No. of Sanctioned Post</th>
<th>No. of Posted</th>
<th>No. of Present</th>
<th>Posted/Sanctioned Ratio (%)</th>
<th>Present/Sanctioned Ratio (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gynecologist/Obstetrician</td>
<td>3</td>
<td>1</td>
<td>1</td>
<td>33.33</td>
<td>100</td>
</tr>
<tr>
<td>Women medical officer</td>
<td>17</td>
<td>6</td>
<td>5</td>
<td>35.29</td>
<td>29.41</td>
</tr>
<tr>
<td>Anesthesiologist</td>
<td>3</td>
<td>2</td>
<td>1</td>
<td>66.66</td>
<td>83.33</td>
</tr>
<tr>
<td>Nurse</td>
<td>25</td>
<td>18</td>
<td>12</td>
<td>72</td>
<td>66.67</td>
</tr>
</tbody>
</table>
Table 4: Availability of EmOC related medicine in facilities in Tharparkar.

<table>
<thead>
<tr>
<th>Medicine</th>
<th>Facility surveyed (n=8)</th>
<th>% availability</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>BEmOC</td>
<td>CEmOC</td>
</tr>
<tr>
<td></td>
<td>M Centers n=2</td>
<td>RHCs n=2</td>
</tr>
<tr>
<td>Number of facilities which has availability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Antenatal Care</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ferrous sulfate</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Folic Acid</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Calcium tablets</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tetanus Toxoid</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Antibiotics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ampicillin</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Benzyl Penicillin</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Gentamycin</td>
<td>0</td>
<td>2</td>
</tr>
</tbody>
</table>

Metronidazole 2 2 3 1 100
Ciprofloxacin 0 2 1 1 50
Nitrofurantoin 0 0 0 0 0
Oxytocics
Oxytocin/syntocinon 1 1 3 1 75
Ergometrine/meth- ergine 0 0 0 1 12.5
Anti-convulsants
Diazepam 0 0 3 1 50
Magnesium sulfate NA NA 0 1 25

Anti-hypertensive
Hydralazine NA NA 0 0 0
Calcium Gluconate 0 0 2 1 37.5
Furosemide 0 0 2 1 37.5
Nifedipine 0 0 0 1 12.5

IV Fluids
Dextrose Water 5%, 10% 0 0 2 1 37.5
Dextrose Saline 0 1 2 1 50
Normal Saline 2 2 3 1 100
Ringer’s Lactate 0 2 2 1 62.5

Emergency Medicine
Adrenaline 0 0 1 1 25
Aminophylline 0 1 2 1 50
Nitroglycerine 0 0 0 1 12.5
Prednisolone 0 2 2 1 62.5
Hydrocortisone 1 2 3 1 87.5

Other Medicine & Equipments
Vitamin K 0 1 2 1 50
Paracetamol 2 2 3 1 100
Anti-tetanus serum 0 1 3 1 62.5
Morphine 0 0 0 1 12.5
Halothane NA NA 2 1 75
Ketamine NA NA 2 1 75
Suxamethonium NA NA 2 1 75
Oxygen available for emergency/operations 0 0 2 1 25
Flow meters 0 0 0 1 12.5
Autoclave/Sterilizer 0 2 3 1 75

Figure 1: Availability of labor & delivery equipment’s at EmOC health facilities of Tharparkar (n = 8)
Discussion

Maternal mortality is social injustice. Only way to stop this is shifting the paradigm as per directions of MDGs and by provision of access to emergency obstetric care services for all women who are pregnant. This will bring reasonable reduction in maternal mortality and help achieving the MDGs in 2015.

There are many neglected areas in Pakistan where access to EmOC services is questionable. This study chose one such far situated and neglected area to assess the availability of emergency obstetric care in public sector health facilities, geographic accessibility, provision of services and utilization by public. The study found that all UN process indicators of EmOC assessment were below the minimum recommended level. Availability of Basic & CEmOC facilities were less than 50% of required in Tharparkar. Health Facility Assessment (PAIMAN) revealed that Basic and/or Comprehensive EmOC were not available in most of the surveyed sample of health facilities of selected districts of all four provinces in 2005 (23). In a survey of 48 health facilities in 4 districts of Sindh almost none were providing quality EmOC (21). Data on detailed assessment of availability, accessibility and utilization of EmOC in district Shikarpur showed that less than 60% health facilities had services of emergencies obstetric care (24). This reflects the actual picture of maternal care and shows why maternal mortality is still high in Pakistan.

Regarding geographical distribution of EmOC facilities it was found in a study that in Punjab and KPK provinces, patients required to travel minimally >30 Kms to >60 Kms to reach an EmOC facility while current study found that people have to travel upto 90 Kms to reach EmOC facility while distance to a referral facility ranged upto 160 Kms (20). These distances are quite long as far as Tharparkar is concerned because the population is rural living and entire district has deserted terrain where metallic roads are still not developed in most areas. People are poor and cannot afford private four wheel vehicles (which can only run in desert).

This causes a second type of delay which leads directly to maternal mortality. A study from Guinea-Bissau found that >25 km distance was associated with increased odds of maternal deaths (25). Regarding utilization of EmOC facilities in terms of UN process indicators it was seen in current study that proportion of all births in EmOC facilities was just near to recommended level only in district headquarter hospital (Mithi) while other EmOC facilities were well below the recommended level. This shows that adequate numbers of mothers are either not reaching these facilities or not using them. According to UN recommendation at least 15% of pregnant women in a given population will develop complications and require access to EmOC and at least 15% of all births should occur in health facilities. Ali et al. (20) also found the similar finding that minimum level of utilization on EmOC facilities is not reached in KPK and Punjab.

They reported that met need for EmOC services was found to be only 11.04% of the women who were expected to experience serious obstetric complications were treated in the EmOC facilities, in which, if excluded the DHQ hospital met need then this proportion fell to just 5% which was quite low. Ali et al. (20) also found the similar results (11.23%) when analyzed the KPK health facilities for EmOC services.

In current study proportion of caesarean section deliveries out of total births occurring in facility was 2.36% which is not in the recommended range (5% & 15%). This indicator shows the lack of adequate skilled staff. In other studies in Pakistan this indicator was found to be well below the minimum recommended level (6, 20, 24). Case fatality rate in current study was 4.5 times more than recommended level. CFR depend on the record of maternal mortality which if kept well can show the true picture. In case of district Tharparker it was quite astonishing. It was 33.33% in THQ Chhachhro while in other 6 facilities was zero. This may be because of underreporting of maternal mortalities in facilities. The causes of death were described as postpartum hemorrhage, eclampsia and others. A study analyzing the Multan district for EmOC services found similar reasons of CFR but at much higher rates, (26) lower rates in Tharparker may be due to lack of proper record maintenance.

Regarding the staff availability for EmOC services, Tharparker is most disadvantaged area. Generally all the health facilities were grossly under staffed and even in

<table>
<thead>
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<tr>
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<tr>
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<td>0</td>
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<td>3</td>
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<td>Diagnostic &amp; other</td>
<td></td>
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<td>3</td>
<td>1</td>
<td>62.5</td>
</tr>
</tbody>
</table>
the posted staff, 23% absenteeism was seen. Political influence was described to be one of causative factors. Due to smaller unattractive incentives, the specialists, women medical officers and other support staff does not want to be posted or stay there for a long period of time. Only offers of a handsome salary package would attract them in less privileged areas. That was seen in case of THQ Nagarparkar where a PPHI posted Gynecologist was working and performing cesarean section of complicated maternity cases. Study from Multan also found the shortage of staff in EmOC facilities (26).

Availability of medicines, equipment, supplies and emergency drugs for management of obstetric complications that exemplify the quality of care offered in the health centers was also assessed. For example Urine dipsticks were unavailable at all facilities including the tertiary hospital. Partogram, an essential best practice tool to monitor progress in labor and to assist in the decision-making process with regard to referral to a higher level of care, was available at only DHQ level. On the other hand, magnesium sulfate was available at the DHQ facility but not on other comprehensive EmOC facility. Delivery set available at only 50% of facilities shows that either these centers are non-functional or not useful for the poor who cannot afford it. While the vacuum extraction forceps and outlet forceps were not available and it was found that assisted delivery was obsolete in the district.

Although antenatal medicine such as iron and folic acid tablets were available at most of facilities (Table 4), the shortage of basic supplies such as broad spectrum antibiotics, oxytocics, gloves and sutures to name a few illustrate the inefficiency in the delivery of supplies, reflect the underutilization of these health facilities (Figure 1). Other supplies like Vitamin K, ATS and medicines used in anesthesia were also only available at 1 DHQ (Mithi).

A comprehensive EmOC centre has a component of blood transfusion which can be made possible when there is functional and equipped blood bank in health facility. Only DHQ hospital had the facility to store the blood for emergency use. No THQ had this facility. Although they had transfused blood to some patients in last three months in which either blood was received from private facility (without screening) or it was drawn from donor and transfused to patients on the spot. Blood screening was partially available and even in less than 50% of health facilities entitled for blood screening and storage. Public sector EmOC facility assessment conducted in this study provides the evidence of the shortcomings in the provision of efficient and effective maternal and newborn health services in District Tharparkar. Although just measuring something will not improve it but this data can be used within quality improvement approaches that focus on the whole health care delivery system. The Devolution of ministry of health and transfer of authority to districts can prove to become a golden opportunity to address & overcome challenge by development of new institutional arrangements to enhance the chances of resources to be effectively used at the local level. On the other hand the district governments should come forward to handle the health related problems being faced by general population.

**Conclusion**

Maternal health general population is severely ignored in Tharparkar. The district is in acute and utmost need of strengthening the district health system and provision of more resources with emphasis on maternal health. Infrastructure development should also be on focus of government so as to attract the health professionals to serve in this area. Availability and presence of skilled staff will be achieved with deployment of staff along with good incentives packages & developing area because most of staff leaves the area due to lack or unavailability of basic life necessities.

Non-governmental organizations, although playing a good but limited role in health and social sector development in Tharparkar. It can be increased in in magnitude and capacity by increasing public private partnership. NGOs has a good penetration and acceptability in general public especially women. Therefore; public-private partnership should be encouraged to educate the women to choose safe motherhood by using these health facilities.

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Predictive Mathematical Modeling and Statistical Analysis for Bacterial Inactivation Using Microwave Treatment

Authors: Asma Sana¹, Mah-laka², Sidrah Hamidani¹, Habib Bokhari³

¹Health Services Academy, Islamabad. ²Quaid-e-Azam University, Islamabad. ³Biosciences department COMSATS Institute of information technology Islamabad. (Correspondence to Sana A: asmasana@hsa.edu.pk)

Abstract

Introduction: Worst flooding catastrophe that has hit Pakistan in 2010, result in huge health and financial crisis. Rain water and poor drainage systems in flooded areas have resulted in outbreaks of various water-borne diseases like cholera, malaria, diarrhea and skin infections due to drinking water contamination. One of the common pathogens found during 2010 floods was Vibrio Cholera. Among Vibrio Cholera O1E1TOR is the major cause of cholera in Pakistan. Therefore provision to clean drinking water to decrease disease burden due to cholera is considered to be important remedy of time.

Methods: This study shows purification of drinking water using microwave treatment is more advanced, rapid and efficient. The data generated pertaining to microwave heating effect on optical density of bacterial colony was used further to show the entire procedure in the form of proposed and predictive mathematical model. Predictive models are used to describe the behavior of microorganisms under different physical and chemical factors such as temperature, pH and water activity. Predictive model proposed in this study is based on the basic assumption of Original Logistic model. Taking the growth curve used in logistic model, per-capita growth constant is redefined, and re-parameterized to incorporate biologically significant parameters in the model. Statistical comparison and analysis is carried out to measure the accuracy of two most widely used mathematical models in the literature that are Gompertz Model and Logistic Model and also of the new proposed logistic type model. This analysis also helps to evaluate the new model verses the original logistic model, statistical techniques used are Hypothesis testing, Information testing and Regression Analysis.

Results: Results from this statistical analysis are compiled by using SPSS (statistical package for social sciences) software. Proposed model shows better curve fitting with experimental curves. These results showed that this model could be a useful tool for predicting possible bacterial growth recovery after microwave irradiation.

Conclusion: The approach used in this study will provide a useful method to get microbiologically clean drinking water by determining the dynamics of such other pathogens.

Key words: Mathematical model, bacterial inactivation. (Pak J Public Health 2013; 3(4): 27-30)
thermal and non-thermal effects (3). Microwaves interact with water molecules and gave them kinetic energy. Resulting ions accelerate and collide which leads to heat production (Shin and Pyun 1997). Advantages of this technique are rapid and uniform heating and reduce energy requirements.

A number of mathematical models are designed to determine the bacterial growth recovery after microwave treatment (5). These models are used to describe the behavior of microorganisms under different physical or chemical conditions. In order to build these models growth has to be measured and modeled.

Since bacteria grow exponentially, it is often useful to plot the logarithm of the relative population size \( y = \ln \left( \frac{N}{N_0} \right) \) against time (Fig. 1).

![Graph showing bacterial growth curve](image)

In literature numbers of models are present which model this growth curve few of these are GOMPERTZ, RICHARDS, STANNARD et al., SCHNUTE, and THE LOGISTICS MODELS and many others.

The objective of the study is to evaluate similarities and differences between the bacterial growth models. It also addresses the question of which model(s) can be most accurate and feasible on the basis of statistical reasoning. Different models are statistically analyzed and compared to determine their accuracy. Models selected from literature for statistical analysis are: LOGISTIC, GOMPERTZ models.

Mathematical equation of logistic and Gompertz models are as follow:

**Logistic model:**

\[
N(t) = \frac{K}{1 + (K / No - 1) \exp(-At)}
\]  

Introducing coefficients \( c1 \) and \( c2 \) where \( c1 > 0 \) and \( c2 > 0 \), Equation (1) becomes:

\[
N(t) = \frac{c1}{1 + c2 \exp(-At)}
\]  

**Gompertz Model:**

\[
N(t) = K \times \exp\left(-\ln\left(\frac{k}{No}\right) \times \exp(-At)\right)
\]  

Introducing coefficients \( c1 \) and \( c2 \) where \( c1 > 0 \) and \( c2 > 0 \), Equation (3) becomes:

\[
N(t) = c1 \times \exp(-\ln c2 \times \exp(-At))
\]

**Material and Methods**

**Samples Preparation**

Bacterial cell cultures were produced by growing in 300ml of TSB (Tryptone Soya Broth) over night in incubator (Thermo Scientific 6240, USA) at 37°C. Bacterial cells were harvested by centrifugation at 4000rpm for 5 minutes at 4°C. Supernatant was discarded and pellets were re-suspended into 700ml of PBS (Phosphate Buffer Saline). Optical Density was adjusted to 0.3(at 600nm).

**Microwave Treatment**

Culture suspended in PBS was distributed equally in 7 sterilized 250ml flask for microwave treatment at 30 second intervals for time up to 180 seconds. All flasks were treated in a Dawlance microwave (Model # DW-308T) at a power of 1350W for 30, 60, 90, 120, 150 and 180 seconds. After treatment, each microwave irradiated flask was immediately shifted to ice. Results were compared with control sample which was not treated with microwave.

**Cell counts**

An aliquot of 100µL of cell suspensions from the control as well as from microwave irradiated samples were five times serially diluted by adding into sterile 900µL of PBS solution. 100µL of cell suspensions from each dilution was spread on 35 nutrient agar plates. Plates were incubated over night in Thermo Scientific 6240, USA incubator at 37°C. Number of bacterial colonies on each plate was counted manually to determine CFU/ml.

**Bacterial Recovery after microwave treatment**

After treatment 1ml aliquots of cell suspensions from treated as well as from control samples were cultured in 100ml TSB at 37°C for 8 hours and tested for optical density (at 600nm) at hourly intervals using a Thermo Spectronic Genesys 10-S spectrophotometer to establish growth curves.

**MODEL DEVELOPMENT:**

According to exponential growth law: “Rate of bacterial...”
growth is proportional to number of bacteria at given time” (6). It can be written as:

\[ dN/dt = rN \]  
(5)

Where N is bacterial population (arithmetic number of bacterial) at specific time (t) and r is growth rate (7).

For a growth curve, the bacterial culture does not need to experience an adjustment process and can multiply exponentially until the population reaches a carrying capacity (K). Figure 2 | Per-capita growth rate (ΔN / N) as a function of population size N(t).

Using above Figure 2,

\[ R = A(K - N) \]  
(6)

Equation (5) takes the form:

\[ dN/dt = A(K - N)N \]  
(7)

By solving Eq. (7) with initial condition \( N(0) = N_0 \) we get:

\[ N(t) = \frac{K}{1 + (K / N_0 - 1) \exp(-KA)} \]  
(8)

Replacing with coefficients c1, c2 where \( c1 = K \) and \( c2 = (K / N_0 - 1) \) Equation (8) becomes:

\[ N(t) = \frac{c1}{1 + c2 \exp(-c1At)} \]  
(9)

Using method reported by (M.H.Zwietering et al, 1990), we can modify Eq. (9) as:

\[ N(t) = \frac{K}{1 + \exp\left[ \frac{4\mu_\lambda}{K}(\lambda - t) + 2 \right]} \]  
(10)

Where:

\[ \mu_\lambda = \frac{K^2A}{4} \]

\[ \lambda = (\ln B - 2) / KA \]

Bacterial growth exhibits Sigmoidal curve starting at the value of zero and then accelerates to a maximum growth rate (\( \mu_\lambda \)) over time, resulting in a lag time (\( \lambda \)). We carry out an approximation of experimental data of local strains of Vibrio Cholera with Logistic Model equation (2), Gompertz Model equation (4) and newly prepared logistic type model Eq. (9). Value of coefficients c1, c2 and A for all three models are given in Table 1:

### Table 1: Calculated values of coefficients for 3 Models.

<table>
<thead>
<tr>
<th>Models</th>
<th>Calculated Coefficients</th>
<th>Microwave treatment time in Seconds</th>
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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Control 30s 60s 90s 120s 150s 180s</td>
</tr>
<tr>
<td>Logistic Model</td>
<td>C₁</td>
<td>1.066 1.059 0.035 0.022 0.030 0.005 0.008</td>
</tr>
<tr>
<td></td>
<td>C₂</td>
<td>117.44 69.6 .842 .833 .4285 .25 .6</td>
</tr>
<tr>
<td></td>
<td>A</td>
<td>1.185 1.057 .1433 .163 .48 0 .4617</td>
</tr>
<tr>
<td>Gompertz Model</td>
<td>C₁</td>
<td>1.066 1.059 .035 .022 .030 .005 .008</td>
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<tr>
<td></td>
<td>C₂</td>
<td>118.44 70.6 1.842 1.833 1.428 1.25 1.6</td>
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<tr>
<td></td>
<td>A</td>
<td>.449 .499 .125 .1305 .402 0 .324</td>
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<tr>
<td>New Proposed Logistic Type</td>
<td>C₁</td>
<td>1.066 1.059 .035 .022 .030 .005 .008</td>
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<tr>
<td>Model</td>
<td>C₂</td>
<td>117.44 69.6 .842 1.833 .4285 .25 .6</td>
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<tr>
<td></td>
<td>A</td>
<td>1.852 1.711 17.033 75.32 55.133 625.64 289.64</td>
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</table>

### Result And Discussion:

Data set used to analyze models consists of optical density of Vibrio cholera after microwave treatment which is one of the effective methods of water disinfection. This data is not only used for statistical comparison of models selected from literature but also for efficacy testing of new proposed model. Statistical analysis comprise of Hypothesis testing, Information Testing
(AKAIKON INFORMATION CRITERION and BAYESIAN INFORMATION CRITERION), Non linear regression, Residual sum of square analysis and graphical analysis. The table 2 shows the optical density (OD) at hourly intervals for recovery of Vibrio cholera after microwave treatment at different time intervals in comparison to the control sample. A slight increase in OD was observed for more than 30 seconds treated samples.

Table 2: Optical density for recovery of Vibrio cholera for control and microwave treated samples samples.

<table>
<thead>
<tr>
<th>Observation Time (hours)</th>
<th>Control sample</th>
<th>Optical density</th>
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<tr>
<td></td>
<td>30s treated sample</td>
<td>60s treated sample</td>
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<tr>
<td>0</td>
<td>0.009</td>
<td>0.015</td>
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<td>1</td>
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<tr>
<td>2</td>
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<td>0.099</td>
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<td>0.988</td>
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<td>7</td>
<td>1.053</td>
<td>1.052</td>
</tr>
<tr>
<td>8</td>
<td>1.066</td>
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</tbody>
</table>

**Statistical analysis:**

A very efficient way to discriminate one model over other is statistical analysis.a statistical technique AICc is used to find the evidence that if there is any need to prioritize a model over other from a finite set of models. if the AICc value of one model is different from other it means the discrimination in terms of accuracy n efficiency lies between these models. the technique applied on above mentioned growth models gives different values for each of these models.

AICc value alone cannot give enough information as it does not tell which model is best to be used for given data set. In order to compare the efficiency of these models and relative goodness of fit a statistical technique Akike information criterion is used. The values of these test are interpreted as preference is given to the model with minimum AIC value.

Formula for this test is:

\[
AIC = N \ln(RSS/N) + 2K
\]

Where N is size of data set, RSS is the residual sum of square and K is the number of regression parameters.

The results obtained from this test shows that GOMPertz MODEL is the best to fit the data with minimum AIC value i-e -70.0937 and the new proposed model is better than logistic model with AIC value=-53.9756 (Table 3).

The results from these tests are further verified using non-linear regression RSS (residual sum of squares) values calculated for above mentioned models and BIC(BAYESIAN INFORMATION CRITERION). The relation of model accuracy to RSS value BIC value is such that smaller the RSS value, more accurate the model is. SPSS is used to find the RSS of these models with given set of parameters. Results from this test imply that GOMPertz is best with smallest RSS value, the new modified model ranks 2nd among these three.

Table 3: Statistical Comparison of Gompertz Model New Proposed Logistic Type Model and Logistic Model

<table>
<thead>
<tr>
<th>MODELS</th>
<th>RSS</th>
<th>AIC</th>
<th>AICc</th>
<th>BIC</th>
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<td>GOMPERTZ MODEL</td>
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<td>-70.0937</td>
<td>50.093</td>
<td>70.302</td>
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<td>NEW PROPOSED LOGISTIC TYPE MODEL</td>
<td>0.0001</td>
<td>-53.9756</td>
<td>-53.9756</td>
<td>54.192</td>
</tr>
<tr>
<td>LOGISTIC MODEL</td>
<td>0.002</td>
<td>-49.1326</td>
<td>29.1236</td>
<td>49.343</td>
</tr>
</tbody>
</table>

**REFERENCES:**

Contextual determinants of Skilled Birth Attendant utilization: An In-depth Analysis of Pakistan Demographic Household Survey

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Abstract

Introduction: Timely recognition and prompt treatment of maternal complications arising during pregnancy and delivery can improve the maternal deaths and the morbidity resulting from complications. Considering the maternal health situation in Pakistan, this paper looks specifically at the factors affecting the skilled birth utilization. The objective of this study is to explore and identify the contextual determinants for the uptake of skilled birth attendants by women of reproductive age in the urban and rural areas of Pakistan.

Methods: Data from the Pakistan Demographic and Health Survey 2006–2007 was used. The dependant variable in the analysis was “delivery assisted by the skill birth attendant (SBA)” which included doctors, nurses, midwives, and lady health visitors. A multistage process was used to create a final model for the dependent variable (delivery conducted by skill birth attendant). Bi-variate relationships between each independent variable and outcome variable were investigated using a binary logistic model. Those independent variables found to be significant at the bi-variate level were included in a multivariate regression model for outcome variable.

Results: More than two third of the respondents (63.3%) were less than thirty (< 30) years in age and one fourth of the women were working women. Overall literacy for women was low with only 35.4% of the women literate. More than 80% of the fathers were less than 40 years of age and 85.4% of them were formally employed. 63.1% of the respondents were from a rural area, whereas only 36.9% were from urban locality. The results of multivariate regression show that wealthy, literate women from urban areas who undertook regular ante natal care from a skilled provider and practiced family planning were more likely to utilize a skilled birth attendant at delivery.

Conclusion: This study has identified major determinants for a skilled birth attendant utilization as respondents’ education, financial/economic status (ability to pay), access to a health facility, antenatal care use and a positive history of family planning. Promoting the availability of and access to skilled birth attendants during delivery, especially in the rural and under-developed areas, is essential for achieving gains in MDG 5.

Keywords: Maternal health; Skilled birth attendant; PDHS; Ante Natal Care; Pakistan. (Pak J Public Health 2013; 3(4): 31-38)
facilities, with targeted policies to give improved access to maternal health care and family planning services (4). Figure 1 shows various initiatives launched with their impact on women’s reproductive health indicators (5). In 1955, a cadre of community-based midwives, the Lady Health Visitors (LHV) were introduced to provide community-based services; a large number of the LHVs are now however, working as static maternal health providers in public and private facilities, leaving very few catering to the rural areas (6). The maternal mortality rate was estimated to be 533 in 1993 and the current rate of 277 shows a reduction of 49% in a span of 20 years. However, it is estimated that at the current rate of progress, Pakistan will not achieve the MDG targets by 2015 (7). In order to accelerate its efforts for improved maternal health, Government of Pakistan created the National program for Family Planning and Primary Health Care in 1994 for providing basic care to women in rural areas. The program currently employs over 100,000 lady health workers (LHWs) providing primary health care to over 60% of the population of Pakistan (8). However, due to a number of weaknesses in the program which include irregular supply of drugs, delayed disbursement of remuneration, poor district health system referral support, imbalanced coverage and no response to LHVs’ expectations for higher financial compensation and career development (9, 10), the program has not had the intended impact on reduction of maternal mortality and increased skilled attendance at deliveries (11).

An examination of the PDHS 1991 and 2006 data reveals that more than 50% of the women prefer a traditional birth attendant’s (TBA’s) assistance for delivery rather than a skilled care provider as shown in figure 2 (12, 13). In spite of the launch of the LHVs and the introduction of the LHW program, there has been little improvement in maternal mortality and morbidity indicators (14). Only 34% of births take place in a health facility, and just 39% of the births are attended by skilled birth attendants (15).

The nationwide initiatives undertaken by the Government of Pakistan have the potential to address the access barriers to seeking skilled care. However, the success of the programs depends highly on the status of the public health infrastructure, available human resource and adequately equipped facilities.

Pakistan’s current strategy for reducing MMR is to promote deliveries by trained persons. For this purpose, the Maternal New born and Child Health (MNCH) program was created in 2007 with the aim of achieving 90% deliveries by trained persons by 2015. The MNCH program has introduced a cadre of community-based midwives (CMWs) to make skilled care available and accessible to underdeveloped rural areas across all regions of Pakistan (16). The premise for the program is that increasing access to safe delivery and family planning services within rural communities will increase the opportunities for women to have positive outcomes for their pregnancies thereby reducing the burden of maternal mortality and morbidity. To achieve this purpose, the skilled birth attendants must be in sufficient numbers and well equipped to provide services in remote and rural areas.

Ensuring equitable access to maternal health services is crucial to reducing maternal deaths. Most life-threatening maternal complications leading to deaths occur late in the pregnancy through 48 hours after delivery (17). Timely recognition and prompt treatment of these conditions can improve the maternal deaths and the morbidity resulting from complications (18). Considering the maternal health situation in Pakistan, this paper looks specifically at the factors affecting the skilled birth utilization. The objective of this study is to explore and identify the contextual determinants for the uptake of skilled birth attendants by women of reproductive age in
the urban and rural areas of Pakistan.

Methods
The present analysis aimed to explore the utilization of skill birth attendants (doctors, nurses, midwives, and lady health visitors). A Multivariate regression modelling has been used on the Pakistan Demographic and Health Survey 2006–2007 data sets, available from Measure DHS (19). This data set comprises of a national sample of 10,023 ever married women and is the most recent available source of information on maternal and child health in Pakistan. The present analysis drew a subset of women who had had a live birth in the five years preceding the survey (n = 9060).

Analyses were performed using SPSS version 18. A multistage process was used to create a final model for the dependent variable (delivery conducted by skill birth attendant). Bi-variate relationships between the each independent variable and outcome variable were investigated using a binary logistic model. Those independent variables found to be significant at the bi-variate level were included in a multivariate regression model for outcome variable. Each independent variable was tested using chi-square test of independents to determine if the independent variable improved the model; variables not contributing to the model were dropped. Thus, the most parsimonious model was built for outcome variable. The odds ratios with 95% confidence intervals were calculated in order to assess the adjusted risk of independent variables, and those with P < 0.05 were retained in the final model.

Outcome indicators and explanatory variables
The dependant variable in the analysis is “delivery assisted by the skill birth attendant (SBA)” which includes doctors, nurses, midwives, and lady health visitors.

The explanatory variables were identified based on their theoretical and empirical value along with their availability in the PDHS data set. The dependent outcome variable was examined according to individual level factors which included the following variables: respondent’s age, education, occupation, husband’s age, respondent’s education, husband’s education, respondent’s working status (respondents who worked at home or away), husband’s occupation, means of transport, co-habit with husband, wanted pregnancy or not, birth order, antenatal visit, family planning history, age at first birth, and complication(s) during the pregnancy. Household level factors included household wealth index which was measured using an asset index approach (Filmer & Pritchett 2001). Community level factors included place of residence (rural/urban).

Transformations were done in some of the exiting variables in the data which were converted to binary variables and coded as 0 or 1. For antenatal visit, women were coded “visited for antenatal care” if they had made at least one visit. For family planning history, women were coded “having family planning history” if they were using any type of family planning services in past before the last delivery. For own transport: availability of any transport (car/truck, motorcycle/scooter) was coded “own transport”.

Results
The distribution of demographic characteristics of the women is shown in Table 1.

Table 1: Percentage distribution of Demographic Characteristics

<table>
<thead>
<tr>
<th>Table 1: Percentage distribution of Demographic Characteristics</th>
<th>Percentage (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (Year)</td>
<td></td>
</tr>
<tr>
<td>• &lt; 30</td>
<td>63.3</td>
</tr>
<tr>
<td>• 31 – 40</td>
<td>30.7</td>
</tr>
<tr>
<td>• &gt; 40</td>
<td>6.0</td>
</tr>
<tr>
<td>Occupation</td>
<td></td>
</tr>
<tr>
<td>• Working</td>
<td>27.35</td>
</tr>
<tr>
<td>• Not working</td>
<td>72.65</td>
</tr>
<tr>
<td>Education</td>
<td></td>
</tr>
<tr>
<td>• Literate</td>
<td>35.4</td>
</tr>
<tr>
<td>• Illiterate</td>
<td>64.6</td>
</tr>
<tr>
<td>Husband’s Age (Year)</td>
<td></td>
</tr>
<tr>
<td>• &lt; 30</td>
<td>35.1</td>
</tr>
<tr>
<td>• 31 – 40</td>
<td>44.1</td>
</tr>
<tr>
<td>• &gt; 40</td>
<td>20.8</td>
</tr>
<tr>
<td>Husband’s Occupation</td>
<td></td>
</tr>
<tr>
<td>• Formal Employment</td>
<td>85.4</td>
</tr>
<tr>
<td>• Self Employment</td>
<td>14.6</td>
</tr>
<tr>
<td>Husband’s Education</td>
<td></td>
</tr>
<tr>
<td>• Literate</td>
<td>64.7</td>
</tr>
<tr>
<td>• Illiterate</td>
<td>35.3</td>
</tr>
<tr>
<td>Type of Residence</td>
<td></td>
</tr>
<tr>
<td>• Urban</td>
<td>36.9</td>
</tr>
<tr>
<td>• Rural</td>
<td>63.1</td>
</tr>
<tr>
<td>Availability of Transport</td>
<td>24.4</td>
</tr>
<tr>
<td>Wealth Index</td>
<td></td>
</tr>
<tr>
<td>• Poorest</td>
<td>19.6</td>
</tr>
<tr>
<td>• Poorer</td>
<td>19.3</td>
</tr>
<tr>
<td>• Middle</td>
<td>19.7</td>
</tr>
<tr>
<td>• Richer</td>
<td>20.4</td>
</tr>
<tr>
<td>• Richest</td>
<td>21.0</td>
</tr>
<tr>
<td>Visited for ANC</td>
<td>32.9</td>
</tr>
<tr>
<td>Used Family Planning Services in Past</td>
<td>29.4</td>
</tr>
<tr>
<td>Child Wanted</td>
<td>86.8</td>
</tr>
<tr>
<td>Cohabit with Husband</td>
<td>90.0</td>
</tr>
<tr>
<td>Age at 1st Birth (Year)</td>
<td></td>
</tr>
<tr>
<td>• &lt;20</td>
<td>54.9</td>
</tr>
<tr>
<td>• 21 – 30</td>
<td>43.0</td>
</tr>
<tr>
<td>• 31 – 40</td>
<td>2.1</td>
</tr>
</tbody>
</table>
Complication during Pregnancy
- Serious Headaches: 51.6
- Blurred Vision: 31.4
- Swelling of Hands: 27.7
- Swelling of Face: 24.5
- Vaginal Bleeding / Spotting: 7.5
- Fits or Convulsion: 3.9
- Epigastric Pains: 33.7

Birth Order
- 1st: 63.3
- > 2: 36.7

More than two third of the respondents (63.3%) were less than thirty (< 30) years in age. Only one fourth of the women were working women.

Overall literacy for women was low, only 35.4% of the women were literate. Fathers were more educated as compared to the mothers i.e. 64.7% of the fathers were literate. More than 80% of the fathers were less than 40 years of age and 85.4% of them were formally employed. Majority of the respondent, 63.1% were living in rural area, whereas only 36.9% were from urban locality. Only 24.4% of the respondents owned the facility of transport at their home like bike, car. The proportion of use of family planning services in past was 29.4%. 90% of the mothers were living with their husbands. Majority of mothers had their first birth before their twentieth birthday.

Severe headache was found as the main complication during pregnancy, 51.6% of the mothers reported serious headache during pregnancy, 31.4% reported blurred vision, 27.7% of the mothers had swelling of hands during pregnancy, 7.5% suffered from vaginal bleeding / spotting, 3.9% of mothers reported fits and convulsion during pregnancy and 33.7% of mothers suffered from epigastria pains.

Table 2 shows the factors associated with the utilization of skill birth attendants at last delivery. Among the women who visited a SBA at last delivery, the percentage of women younger than 30 years was significantly higher as compared to those who didn’t visit SBA. Data revealed that the tendency to approach SBA at last delivery was considerably higher in working women as compared to housewives. Literacy was associated with visit to a SBA at last delivery. In women who visited a SBA at last delivery, 51.2% of them were literate and among those who didn’t, only 19.7% were literate. Other factors significantly associated with SBA were husbands’ age less than 30, husbands’ education and urban residence (Table 2).
Availability of transport was associated with utilization of SBA service; about 31.3% of the respondents who visited SBA at last delivery had the transport facility at home and only 17.5% of respondents who didn’t had a vehicle. Also with utilization of SBA service at last delivery increased with increasing wealth index.

Antenatal visits and family planning history were associated with the utilization of SBA service at last delivery. Amongst the respondents who visited the SBA, 51.4% visited the health facility for at least one time for antenatal care as compared to 14.3 % for those who didn’t visit the SBA at last delivery and 36% had a history of use of any family planning services in past.

Complications during pregnancy were associated with increased utilization of SBA service. Table 2 shows that women who had problems like blurred vision, swelling of hands, swelling of face, vaginal bleeding/spotting and fits or convulsion, majority of them visited the SBA at last delivery. Birth order (primi gravida) was also significantly associated with utilization of SBA service.

Table 3 describes the results that were revealed by the multivariate logistic regression model. The factor associated as a hurdle in utilization of SBA’s services at last delivery was underutilization of antenatal care services during last pregnancy. Respondents who did not visit for antenatal care during pregnancy were more likely (OR 3.78) to visit other service providers than SBA.

### Table 3: Results of multivariate logistic regression model

<table>
<thead>
<tr>
<th>Factors associated with utilization of SBA service in last delivery</th>
<th>P-value</th>
<th>OR</th>
<th>C.I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mother’s Education (Literate)</td>
<td>0.000</td>
<td>1.68</td>
<td>1.43 – 1.92</td>
</tr>
<tr>
<td>Illiterate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wealth Index (Richest)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poorest</td>
<td>0.000</td>
<td>4.83</td>
<td>3.74 – 6.26</td>
</tr>
<tr>
<td>Poorer</td>
<td>0.000</td>
<td>2.81</td>
<td>2.81 – 4.49</td>
</tr>
<tr>
<td>Middle</td>
<td>0.000</td>
<td>2.35</td>
<td>2.35 – 3.66</td>
</tr>
<tr>
<td>Richer</td>
<td>0.000</td>
<td>1.52</td>
<td>1.52 – 2.31</td>
</tr>
<tr>
<td>Type of Residence (Urban)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rural</td>
<td>0.000</td>
<td>1.38</td>
<td>1.20 – 1.60</td>
</tr>
<tr>
<td>Visited for ANC (Visited for ANC)</td>
<td>0.000</td>
<td>3.78</td>
<td>3.27 – 4.37</td>
</tr>
<tr>
<td>Used Family Planning Services in Past (Yes)</td>
<td>0.012</td>
<td>1.20</td>
<td>1.09 – 1.31</td>
</tr>
<tr>
<td>R²</td>
<td></td>
<td>23.5</td>
<td></td>
</tr>
</tbody>
</table>

Note: For categorical explanatory variables, the reference group is indicated in parentheses.

Furthermore, a clear gradient was found within the different levels of wealth index. Respondents with high wealth index (richest) had a higher likelihood of visiting SBA at last delivery than those with middle and poorer.

Low literacy level and rural residence of respondents was also associated with not visiting the SBA. Use of family planning services in past was associated with a greater probability of visiting SBA in last delivery.

### Discussion

This study has identified major determinants for a skilled birth attendant utilization as respondents’ education, financial/economic status (ability to pay), access to a health facility, antenatal care use and a positive history of family planning.

The results of the multivariate analysis reveal that the level of education is a statistically significant predictor for the utilization of skilled birth attendants. Literate mothers are more likely to utilize a skilled birth attendant at delivery than an illiterate mother. This finding is consistent with those reported from developed and developing countries which show that mother’s education is strongly associated with all types of health behaviours. An educated mother is likely to have increased knowledge and awareness about health services, exercise more autonomy in decision making in health matters, be familiar with modern medical facilities, has better communication with family and health care providers in terms of demanding care (20-25).

Education is also more likely to be associated with a better financial capacity and hence ability to afford the costs of utilizing maternal health services. Our analysis shows that wealthier the mother, the more likely she is to visit a skilled birth attendant for delivery and a respondent belonging to a poorer household is more likely to visit non-skilled maternal care service providers. Several studies have identified financial constraints as the most important factor in non-utilization of health care (26-29). Seeking skilled maternal care may include costs of travel, medicines, provider fees and poorer households with limited financial resources are less likely to use a health facility for delivery services (20, 30-32).

Our analysis shows that underutilization of skilled birth attendants is more in rural areas as compared to urban areas. This difference in utilization may be accounted for by the fact that there are more and better equipped health facilities in urban areas than in rural. Another factor is the distance to the facility which may be more in rural areas than in urban localities (33, 34). Large distances to facility are a deterrent factor due to a poor road and transport network in rural areas and the additional costs incurred in travelling to a facility (35, 36).
Our analysis also found that antenatal care visits are positively correlated with the utilization of skilled birth attendants at delivery. This may be due to the fact that an antenatal visit is an opportune interaction with qualified care providers who can give women information about healthy maternity behaviours, status of the pregnancy, identify potential complications and give information about place and mode of delivery (20, 37). The information exchange can lead to an informed and timely decision making. ANC visits also indicate the availability of and access to maternal health services nearby as women closer to a health facility are more likely to deliver with a skilled birth attendant (22).

The use of contraception was also found to be positively associated with receiving skilled care. A study from Pakistan on factors associated with contraceptive adoption found that educated women are more likely to use contraception as opposed to illiterate women (38). The family planning services in Pakistan are provided both by the public and private sector, however, services in rural areas are almost exclusively provided by government deployed Lady Health Worker (LHW) who is also trained for providing antenatal care to women resident in villages. The interaction is opportunity for the health worker to give information about safe motherhood practices and also signifies a woman's familiarity with the health system and facilities available potentially explaining the findings in our study.

Over the years, Government of Pakistan's investment in health sector including maternal and child health, has increased many folds, however, the investments in social sector have suffered from cuts in development expenditures due to falling macroeconomic growth and rising debt servicing (39). The major impact has been on the health and education sector. Although the expenditure in maternal and child health by the government and donor assistance has increased, it is not well documented. The political instability, poor governance and leadership, lack of coordination between public, private and NGO sectors have resulted in government's inability to effectively channel limited resources for improved maternal and child health services (14, 40). The overall impact has been a sluggish improvement in maternal health Pakistan, with a maternal mortality rate ranging from 238 to 856 (13).

Conclusions
Taking onto account the prevailing scenario and the preference of the rural women for a home delivery, the launch of the MNCH program in 2007 and introduction of a licensed, community based midwife (CMW) in rural areas is an appropriate initiative for reducing maternal mortality through skilled birth attendants (16). A community based midwife can provide the rural communities with the desired home based skilled care and service. However, initial assessments of this initiative have shown that the CMWs do not have a strong administrative and supervisory support from the program and the health system (41-43) and lack of necessary medicines and equipment is restricting their ability for providing home care. The recent national administrative reform of devolution of social sector services, including health, to Pakistan’s provincial governments can be utilized for strengthening the MNCH program with the aim of improving maternal health. The provinces can channel the limited financial resources more effectively according to the context of the local population, provide functional field support to the CMWs and strengthen the health systems for a strong referral support.

Considering the current progress, it is evident that Pakistan is not on the track for achieving MDG 5 by 2015 (7). Promoting the availability of and access to skilled birth attendants during delivery, especially in the rural and under-developed areas, is essential for achieving gains in MDG 5. This can be achieved by strengthening the community based health workers (LHWs and CMWs) for providing skilled care to rural, underserved and marginalized populations. A wider social policy, encompassing improvement in social determinants of health like education, inequalities, employment, social support and security is also crucial for improving the overall health status, especially mothers and children.

Competing Interests
The authors declare that they have no competing interests.

Authors' contributions
MS conceived of the study and drafted the manuscript. AY and SH performed the analysis of the data set. MS, AY and SH participated in the design of the study, and helped to draft the manuscript. All authors read and approved the final manuscript.

Acknowledgements
The authors wish to thank Dr. Naushin Mahmood for her guidance.

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Measuring cognitive potential of children in Pakistan: building up a case

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Abstract

Children in developing countries are not fulfilling their potential for growth, cognitive or socio-emotional development. Children living in poverty are exposed to increasing number of risks, and the cumulative effects of these risk factors on development become more evident as children get older. Development is thus malleable and can be enhanced by interventions affecting the child, the environment or both. Evidence-based intelligence testing can justify allocation of resources for mainstreaming children with below-average cognitive potential. In this background, this review was conducted with an overall aim to build up a case for the assessment of cognitive potential of children in Pakistan to develop interventions if the children are not achieving their full cognitive potential.

Key words: Children, Pakistan, cognitive potential, general intelligence factor, primary education, mental health. (Pak J Public Health 2013; 3(4): 39-43)

Introduction

Child development is the scientific study of processes of change and stability from conception through adolescence (1). Change and stability occur as the product of several processes (2): biological, cognitive and psychosocial. Biological processes involve changes in the child’s body. Cognitive processes involve changes in the child’s thinking, intelligence, and language. Psychosocial processes involve changes in the child’s relationships with other people, changes in emotion and changes in personality. All three domains are intertwined (1).

Changes throughout child development result from multidirectional interactions between biological factors and environmental influences (parent-child relationships, community characteristics, cultural norms) (3). It is now well accepted that development is a process that is not determined independently by nature or nurture alone, but by “nature through nurture” (4). The conceptualization of development as a dynamic interplay between biological and environmental factors suggests that development is malleable and can be enhanced by interventions affecting the child, the environment or both (5).

Children in developing countries are growing up at a disadvantage. First paper in a recent child development series in the Lancet estimated that over 200 million children under 5 years worldwide are not fulfilling their potential for growth, cognitive or socio-emotional development. During the first five years of life, children lay the groundwork for lifelong development (4). Children living in poverty are exposed to increasing number of risks over time, and the cumulative effects of these risk factors on development become more evident as children get older. Examples of risks might include poor infant nutrition, stressful life events, poor mother-child interactions, absence of father or other social supports, exposure to environmental risks, or changes in family employment status (5).

In this background, this review was conducted with an overall aim to build up a case for the assessment of cognitive potential of children in Pakistan to develop interventions if the children are not achieving their full cognitive potential.

Methods

English language, open access literature from any period till the date of review was searched. Key words used included children, Pakistan, cognitive potential, general intelligence factor, primary education and mental health. Electronic databases of PubMed and Google scholar were utilized for this review.

Linkages between child development and the Millennium Development Goals (MDGs) have been analyzed in the review. Importance of identification and integration of children with below-average cognitive potential has been discussed. Moreover, extraction of general intelligence factor (g) and its practical interpretation have also been analyzed.
Results
(I) Linkages between child development and MDGs 1, 2 & 4

MDGs have captured the attention of the international health and development community in recent years (6). Focus on the childhood mortality survivors (MDG 4) has always been undermined by the exclusive use of cause-of-death as the standard measure of child health status. In developing countries, many of these children acquire disabling disorders attributable to their living conditions, poverty (MDG 1) and secondary infections. They are thus disadvantaged from the early childhood in competing with their privileged peers for life opportunities. Available social, medical and educational services in the developing world are not capable of integrating such disadvantaged children into the larger society. For most developing countries, already overwhelmed by the challenge of dealing with prevailing fatal and communicable diseases, there is a moral dilemma between child survival and wellbeing (7).

For attaining universal primary education (MDG 2), educational system is required to address needs of children with learning difficulties. It is plausible to hypothesize that learning and emotional problems are important risk factors for primary school dropouts in educational systems of the developing world. Education equips children with the core abilities to adapt and cope with the difficult situations, utilize available resources and serve as agents of change. There are several areas of congruence between MDGs and mental wellbeing (8).

During the past decade, much progress has been made towards universal primary education in developing countries. Many middle-income countries in the world including Chile, China, Cuba, the Republic of Korea, Singapore and Sri Lanka have achieved universal primary education by building up robust primary education systems. Low-income countries such as Ethiopia, Guinea, and Mozambique have shown sustained progress towards the MDG 2. But the state of primary school dropouts in Pakistan is dismal with the second rank amongst countries of the world. On the other hand, Pakistan’s neighboring countries India and Bangladesh are on the right track to achieve MDG 2 (9).

(II) Identification & integration of children with below-average cognitive potential

In developed countries, child cognitive testing is undertaken with the goal to identify children with special needs in order to help them with special services. Standardized child cognitive assessment tests are administered in the exact same manner to all children in order to evaluate and compare their performance on the same cognitive abilities (10). There is a whole battery of tests that try and capture child intelligence which is also a part of child cognitive development.

In the aftermath of laws requiring mandatory public education for all children during 1882, Alfred Binet was asked by the French Ministry of Education to identify students who needed special help in coping with the school curriculum. Before this, most school children came from upper-class families. With the requirement of education for all children, schools had to educate a much more diverse group of children with some of the children having no prior education appeared incapable of benefiting from the school curriculum (11). Binet attempted to develop experimental techniques to measure intelligence. He tried a variety of tasks on his own children as well as on other children in the French school system. He together with Theodore Simon developed the Binet-Simon intelligence scale in 1905 (12). The scoring of the test produces a number called the child’s mental age (11).

Following a series of refinements to the Binet-Simon intelligence scale in the United States, the Stanford-Binet test was developed in 1916 at Stanford University. Lewis Terman standardized and normed the Binet test on California school children. He also added a concept developed by another psychologist, William Stern (1871–1938), which became the well-known Intelligence Quotient (IQ score) (11). In India, Rice’s Hindustani Binet intelligence test was published in 1929 in order to provide education better adjusted to child’s learning capacity. This led to the work of V.V. Kamat in producing Marathi and Kannada versions of the Stanford-Binet tests in 1936, with subsequent revisions (13).

It is critical to assess cognitive development of children in Pakistan as well. Evidence-based standardized cognitive testing can justify allocation of resources for mainstreaming children with below-average cognitive potential. Future productivity of such children can be enhanced by identifying and addressing their cognitive problems. Evidence suggests that where ordinary system of schooling is of no avail, cognitive stimulation by modern psychological methods proves efficacious. More than two millennia have passed since the psychology of using play to motivate children had been explained to king Milinda at Sialkot, or the toys had been used at Taxila. Ironically, the importance of play as a source of motivation in learning of “not too smart” child still needs to be re-established in Pakistan. Developed world’s educational psychology of the past 150 years has proven importance of the cognitive stimulation and encouragement for children.
with below-average cognitive potential. After receiving supportive services, such children had shown average or above-average performance in whether it was text-based school-work, or mathematical manipulation, or art, or sport (13). Undoubtedly, much of this can also be achieved with below-average children in Pakistan.

(III) Extraction & interpretation of general intelligence factor (g)

Originally, intelligence tests measured verbal and nonverbal functioning, and offered an overall estimate of cognitive functioning based primarily on these two constructs (14). British psychologist Charles Spearman (1927) suggested that intelligence is comprised of one general factor (g) that is common to all of the tasks that are used in the assessment of intelligence, and as many specific factors as there are tasks (15). Concurrent advances in factor-analytic techniques were applied to measure mental abilities to further clarify the nature of intelligence. In the 1950s, intelligence testing began to focus on measuring more discrete aspects of an individual’s cognitive functioning requiring a wide array of subtests tapping many different mental abilities. Cattell introduced the theory that intelligence was composed of two factors: fluid intelligence (gf) and crystalline intelligence (gc). Horn latter expanded on Cattell’s original gf-gc theory to include visual perception, short-term memory, long-term storage and retrieval, speed of processing, auditory processing ability, quantitative ability and reading and writing ability factors (16).

Despite the current trend toward increased emphasis on multiple, more narrowly defined cognitive abilities, the concept of an underlying global aspect of intelligence remains valid. Most contemporary intelligence theories view intelligence as having hierarchical structure, consisting of broad general factor at the highest level, with subsequent levels including broad domains of cognitive ability that are further divided into more discrete or narrow abilities. Results of factor analytic research generally converge in the classification of 8 to 10 broad intelligence factors (16). Thus intelligence has a hierarchical structure with g located at the apex of the hierarchy (stratum III). At a lower order in the hierarchy (stratum II), several broad ability factors are distinguished: fluid intelligence, crystallized intelligence, general memory, visual perception, auditory perception, retrieval, or cognitive speed. Lastly, stratum I is based on specific abilities, such as induction, lexical knowledge, associative memory, spatial relations, general sound discrimination, or ideational fluency (figure 1) (17).

The Wechsler intelligence scales are the most commonly used tests for the assessment of cognitive development in the United States (18). Wechsler based his tests on the premise that intelligence is a global entity because it characterizes the individual's behaviour as a whole, and it is specific because it is composed of elements or abilities that are distinct from each other. Wechsler selected and developed subsets that highlighted the important cognitive aspects of intelligence: verbal comprehension, abstract reasoning, visual spatial processing, quantitative reasoning, memory, and processing speed (16). The Wechsler Preschool and Primary Scale of Intelligence (WPPSI) was introduced in 1967 as an adaptation of the Wechsler Intelligence Scale for Children (WISC) to preschool children (19).

Modern IQ tests use a scaling method based on the normal curve to compute the IQ scores. This innovation was developed by Wechsler which is known as deviation IQ method. It permits the test user to interpret a person’s IQ score in terms of the proportion of people in the normative sample that had scores above and below the person’s obtained score. IQ scores tend to closely follow a mathematical distribution known as the normal distribution. For mapping the IQ scores onto the normal distribution, the mean (average) and standard deviation (a measure of score’s variability) of a large standardization sample is computed (20). These statistics are then used in a conversion formula to convert the “raw” scores from the test into “standard” IQ scores having a predetermined mean and standard deviation. For the Wechsler tests the mean will be set to 100 and the standard deviation to 15 points (21).
Most intelligence experts now use g as the working definition of intelligence. Correlation of general intelligence with occupational achievement suggests that g reflects an ability to deal with cognitive complexity (figure 2). This factor seems to have considerable influence on a person's practical quality of life including performance at school and on the job, dropping out of the school, chances of divorcing, being unemployed or having illegitimate children (15).

**Conclusion**

The Bronfenbrenner model of ecology of human development acknowledges that children do not develop in isolation but in relation to their family and home; school, community and society (22). Child development is malleable and can be enhanced by interventions affecting the child, the environment or both (5). Strategies for identifying and mainstreaming children with below-average performance will not only help achieving universal primary education in Pakistan but will also enhance future productivity of the children.

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Insecticide Susceptibility/Resistance Status of Anopheles Mosquitoes in District Bahawalpur, Punjab Pakistan: An Entomological Survey

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Abstract:
The main issue for effective malaria control programme in Southern Punjab is the insecticide resistance. While resistance to pyrethroids, is the alarming situation for the Malaria Control Program. As the pyrethroids are being used for long lasting bed nets (LLINs) and Indoor Residual Spraying (IRS). The present study utilized the World Health Organization (WHO) test kits and insecticide impregnated papers to determine the insecticide susceptibility/resistance status of malaria vector mosquitoes in Bahawalpur. Results from the study showed that *An. stephensi* was resistance to DDT, Fenitrothion, Malathion, Deltamethrin and Lambda cyhalothrin in all localities of District Bahawalpur. This study forms an important evidence base for the strategic planning of vector control in district Bahawalpur.

Key Words: *Anopheles*—Insecticide—Pakistan—resistance—Susceptibility—South Punjab. (*Pak J Public Health* 2013; 3(4): 44-45)

Survey Report

Malaria is the world’s most important vector-borne disease that puts approximately 3.3 billion people at risk in 106 countries (1) and causes 1 million deaths annually (Roll back Malaria 2008). Children and pregnant women are most vulnerable to malaria, with a child dying from malaria every 40 seconds (2). In the World Health Organization (WHO) Eastern Mediterranean Region (EMR), malaria is endemic in 9 countries with 5% of the population at risk (3). Approximately 500 known Anopheline species found worldwide, only 60 *Anopheles* species are known malaria vectors (4). In the EMR, 18 out of 70 Anopheline species are confirmed malaria vectors (5). Out of 24 reported Anopheles species in Pakistan (6) only two primary malaria vectors, *An. stephensi* and *An. culicifacies*, have been reported.

Malaria control in Pakistan was started as Malaria Control Activity in 1950. In 1961 this program became the Malaria Eradication Program with the objective to interrupt malaria transmission with residual insecticides, but in 1969 this program suffered technical, administrative, and financial problems. Insecticide resistance in vector mosquitoes and anti-malarial drug resistance posed major technical hurdles. The failure of the Malaria Eradication Program led to the initiation of a five year National Malaria Control Program (MCP), where control of vector mosquitoes was the main control strategy.

Baseline work on insecticide resistance monitoring in the country was carried out in 1985 as the first large-scale field survey to map insecticide resistance status in 11 randomly selected districts in the Punjab province (7). *An. culicifacies* was susceptible to all insecticides except DDT, but for *An. stephensi* resistance to Malathion was widespread. During the last 25 years, very little work has been done to monitor the insecticide resistance status of Anopheline mosquitoes in Pakistan. This lack of information on the resistance status of vector mosquitoes can have serious technical and financial consequences, especially when pyrethroids are used extensively for agricultural and household purposes. Development of undetected vector resistance to currently effective pyrethroids can lead to uncontrollable epidemics by vector-borne diseases. The present study was designed to determine the insecticide susceptibility/resistance level in malaria vector mosquitoes in Bahawalpur.

Adult mosquitoes were collected from three randomly selected districts of Bahawalpur of Bahawalpur using mouth aspirators and mechanical sweeper machines. Collections were made from human dwellings and animal sheds from March to June 2013. Female mosquitoes of all stages, including fed, half gravid, and gravid, were collected from the different locality. WHO Standard bioassay adult test kits (8) were used. Wild-
caught fed females were tested under field conditions; the adult female mosquitoes were exposed to the specified doses recommended by WHO.

WHO Impregnated test papers (DDT 4%, Fenitrothion 1.0%, Malathion 5% and Deltamethrin 0.05%) were used, with a 1-hour exposure period. Water soaked cotton plug was placed on top of the holding tube during the 24-h holding period, care was taken that water does not drip down the tube. After the one hour exposure and 24 holding period mortalities were calculated. Appropriate controls were run in all cases. Normally there were no mortalities in the controls during conducting the test. The percentage of mortalities was calculated and used to establish the status of susceptible/resistant status of the An. stephensi. Interpretations of mortality data for determination of susceptibility status was made according to the criteria set by World Health Organization (8).

Anopheles stephensi was exposed one chlorinated hydrocarbon (DDT 4%), two organophosphates (Fenitrothion 1.0%, Malathion 5%), two pyrethroids (Deltamethrin 0.05% Lambdacyhalothrin 0.05%). The percentage mortalities were observed in various locality of each district.

As shown in (Table 1) An. stephensi was found resistance against DDT, Deltamethrin, Fenitrothion, and Malathion with mortalities ranges from (27-36%), (85-89%), (76-82%), (73-78%) respectively.

Table 1: Summary of results of susceptibility/resistance tests done on An. stephensi with DDT 4%, Deltamethrin 0.05%, Fenitrothion 1.0% and Malathion 5% at different localities of district Bahawalpur.

<table>
<thead>
<tr>
<th>District</th>
<th>Species</th>
<th>Locality</th>
<th>No ♀ tested</th>
<th>Mortality</th>
<th>Status</th>
<th>No ♀ tested</th>
<th>Mortality</th>
<th>Status</th>
<th>No ♀ tested</th>
<th>Mortality</th>
<th>Status</th>
<th>No ♀ tested</th>
<th>Mortality</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>HI</td>
<td>An. stephensi</td>
<td>HI</td>
<td>100</td>
<td>27</td>
<td>R</td>
<td>103</td>
<td>86</td>
<td>R</td>
<td>102</td>
<td>81</td>
<td>R</td>
<td>104</td>
<td>73</td>
<td>R</td>
</tr>
<tr>
<td>LS</td>
<td></td>
<td>LS</td>
<td>104</td>
<td>36</td>
<td>R</td>
<td>102</td>
<td>85</td>
<td>R</td>
<td>100</td>
<td>76</td>
<td>R</td>
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<td>HP</td>
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<td>HP</td>
<td>103</td>
<td>40</td>
<td>R</td>
<td>102</td>
<td>86</td>
<td>R</td>
<td>102</td>
<td>80</td>
<td>R</td>
<td>102</td>
<td>76</td>
<td>R</td>
</tr>
<tr>
<td>YZ</td>
<td></td>
<td>YZ</td>
<td>106</td>
<td>36</td>
<td>R</td>
<td>104</td>
<td>89</td>
<td>R</td>
<td>103</td>
<td>82</td>
<td>R</td>
<td>100</td>
<td>75</td>
<td>R</td>
</tr>
</tbody>
</table>

χ² = 3.269, df=3, p = 0.352
χ² = 0.245, df=3, p = 0.970
χ² = 0.491, df=3, p = 0.921
χ² = 1.174, df=3, p = 0.759

HI: Head Islam, LS: Lal Sohna, HP: Head Punjnad, YZ: Yazman
S= Susceptible if 98-100% observed mortality, ? = 90-97% observed mortality suggests the possibility of resistance that needs to be further confirmed, R= Resistant if < 90% observed mortality. Level of Significance p<0.05; non-significance p>0.05; df= Degree of freedom, χ²= Chi Square Value

Conclusion
It can be concluded that in view of the present status of resistance in disease vectors, development and implementation of comparatively newer strategies, for vector pest management specially the integrated vector management (IVM), need to be implemented in the light of information generated by this study. In order to manage, prevent or slowing down the development of resistance to the presently used effective insecticides, a strategic approach for judicious use of pesticides is essential. This approach requires efficient and regular monitoring of susceptibility status of disease vectors, as an important component of IVM. Unfortunately pesticides resistance monitoring and surveillance is extremely inadequate in the country. Resistance management policy and strategy is not possible without strong evidence obtain from monitoring and surveillance.

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