Infant Mortality Rate Among Urban and Rural Population In Abu-Haraz Administrative Area, Shikan Locality, North Kordofan State, Sudan

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ABSTRACT: A stratified random sample was taken using probability proportion method. Accordingly 296 households were allotted to urban areas and 450 households to rural villages. Ten clusters in the urban areas and 15 others in the rural areas were chosen. In each cluster 30 houses were selected randomly. The data were analyzed statistically using the Statistical Package for Social Science (SPSS). The overall infant mortality rate was 120.6 per 1000 live births, 25.4 per 1000 live births for town sector and 95.2 per 1000 live births for rural sector. Infant mortality rate was higher in the rural sector than the town sector, and the post neonatal mortality rate was greater than the neonatal mortality rate. Pneumonia and malaria were the major causes of the infant mortality among the study population. In conclusion, the infant mortality rate was higher in the rural sector compared with town sector, and the causes of infant mortality in the area were variable. Pneumonia and malaria were the main causes and the infant mortality mainly occurred in the post neonatal period. The study recommended reduction of infant mortalities by application of Integrated Management of Childhood Illnesses (IMCI) programs, improvement of antenatal care and family planning services, identifying modifiable risk factors, development of road map towards achieving United Nations Millennium Development Goals in 2007 to reduce the infant mortality rate, and conducting further studies.

KEYWORDS: Infant Mortality Rate(IMR), Urban, Rural, Abu – Haraz Administrative area

INTRODUCTION

Infant mortality is defined as the number of deaths of infants (one year of age or younger) per 1000 live births. The most common cause of infant mortality worldwide has traditionally been dehydration from diarrhea. Because of the success of spreading information about Oral Rehydration Solution (a mixture of salts, sugar, and water) to mothers around the world, the rate of children dying from dehydration was decreasing and has become the second most common cause in the late 1990s. Currently the most common cause is pneumonia. Other causes of infant mortality include congenital malformation, infection and Sudden Infant Death Syndrome (SIDS). Infanticide, child abuse, child abandonment, and neglect may also contribute to infant mortality (1).

The related phases are categorized into the followings:

• Prenatal mortality only includes deaths between the fetal viability (22 weeks gestation) and the end of the 7th day after delivery.
• Neonatal mortality only includes deaths in the first 28 days of life.
• Postnatal mortality only includes deaths after 28 days of life but before one year.
• Child mortality includes deaths within the first five years after birth (2).

Infant mortality rate (IMR) is the number of newborns dying under one year of age divided by the number of live births during a year. IMR is also called the infant death rate. It is the number of deaths that occur in the first year of life for 1000 live births. In the past, infant mortality claimed a considerable percentage of children born, but the rates have been significantly declining in the Western countries in modern times, mainly due to improvements in basic health care, though high technology medical advances have also helped. Infant mortality rate is commonly included as a part of standard of living evaluations in economics (3).
The infant mortality rate correlates very strongly with and is among the best predictors of state failure. IMR is also a useful indicator of a country's level of health or development, and is a component of the physical quality of life index. Some claim that the method of calculating IMR may vary between countries based on the way they define a live birth. The World Health Organization (WHO) defines a live birth as any born human being who demonstrates independent signs of life, including breathing, voluntary muscle movement, or heartbeat (4).

A good source for the most recent IMRs as well as under 5 mortality rates (U5MR) is the United Nation International Children and Education Fund (UNICEF) publication 'The State of the World's Children'.

For the world, and for both Less Developed Countries (LDCs) and More Developed Countries (MDCs), IMR declined significantly between 1960 and 2001. World infant mortality rate declined from 126 in 1960 to 57 in 2001 (5).

However, IMR remained higher in LDCs. In 2001, the IMR for Less Developed Countries was 91 and about 10 times as large as it was for More Developed Countries (8). For Least Developed Countries, the IMR is 17 times as high as it is for More Developed Countries. Also, while both LDCs and MDCs showed dramatic reductions in infant mortality rates, reductions among less developed countries are, on average, much less than those among the more developed countries.

Sudan’s infant mortality rate is 81 deaths per 1,000 live births (Sudan household survey “SHHS” 2006), but it is 69 per 1000 live births according to (UNICEF annual report 2009) include in reference list. The infant mortality rate is 64.9 death per 1000 live births (April 2009) according to the World Fact book 2009 estimates (6).

Although the infant mortality rate in Southern Sudan has decreased, it stands at 102 per 1000 live births. The infant mortality rate in Darfur stands at 76 per 1000 live births. The infant mortality rate in Khartoum and Northern Areas stands at 70 per 1000 live births. Countrywide, the infant mortality rate goes down from 143 in 1990 to 83 in 2006. In Wad Madani Locality, Gezira State, the IMR is 77 deaths per live birth in 2004. There is no study conducted in North Kordofan State which illustrates the IMR, and this is one of the strong motivations that encouraged us to conduct the study in this area.

The study aimed to calculate the infant mortality rate among urban and rural population and to determine and compare the causes of infant mortality among these two groups in Abu Haraz Administrative area, Shikan Locality, North Kordofan State, Sudan.

MATERIALS and METHODS
A cross-sectional community based study was conducted.

Study Area:
The study area was Abu Haraz Administrative Area, Shikan Locality, North Kordofan State, Sudan. It comprises of Obeid city and its rural area. The total population of the locality is 172,000. Obeid city has 60 town sectors while in the rural area there are 200 villages. Climate is poor savannah. The population depends, mainly, on mixed farming and animal grazing.

Study Population:
The study population is all male and female infants aged one year or less, alive or dead during the study period with exclusion of other children.

Sampling:
Sample Size: Seven hundreds and forty six households were chosen randomly and included in the study, 296 from town sector and 450 from rural area. All households gave consent and the local authorities did.

Sampling Methodology: A stratified random sampling method was used, considering town sector and rural area as two strata.

Selection of clusters:
These households were grouped into clusters. Each cluster contains 30 households as follow:
Town sectors households 296/30 (numbers of households in the cluster) = 10 clusters.
Villages households 450/30 = 15 clusters.

**Sample collection technique:**
To select households, a systematic random sampling was used. Starting in the centre of the village/town sector, a pen was thrown in the air and when fallen on the ground, then walking in the direction indicated by the sharp end, the first reached house was taken as the first house. The number of houses in each town or village sector was divided by 30 to give interval between houses e. g. if the houses are 180 then divided by 30 give interval of 6. So, moving on the same direction, the six houses were taken as the second interval and so on till the sample size (30 houses). was reached If the mother/care taker in one house was unwilling to participate, then the next house in the same direction was taken. If the end of the place was reached then turning to the right side the process was continued till the sample was completed.

**Data collection tools:**
Researcher and Four trained medical students interviewed the required sample size of population in both urban and rural sector using a designed questionnaire and they conducted Focus Group Discussions (FGDs). Focus groups were formed by inviting around 6 to 10 people to participate for a session that lasted for about an hour. Then they started discussing an issue that people have strong feelings about the IMR and its causes.

**Data analysis:**
Quantitative data was processed and analyzed using Statistical Package for Social Science (SPSS) for Windows 15.0 computer software. Chi-square was used to compute the IMR and estimate risks of an adverse outcomes. Compared statisticced, means comparison between urban and rural sectors in the investigated group were used in this analysis. Dichotomized variables were compared. Confidence Interval (C.I) at 0.05 or less was considered significant for statistical tests.

**Limitation:**
There were four unwilling households from urban area refused to participate in the study.

**RESULTS**
Residence, the live status, the causes of deaths and the time of death (neonatal or post neonatal):

<table>
<thead>
<tr>
<th>The area</th>
<th>Urban</th>
<th>Rural</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
<td>296</td>
<td>450</td>
<td>746</td>
</tr>
<tr>
<td>No. of infant death</td>
<td>16</td>
<td>74</td>
<td>90</td>
</tr>
<tr>
<td>IMR per 1000 live births</td>
<td>25.4</td>
<td>95.2</td>
<td>120.6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cause of infant death</th>
<th>Neonatal</th>
<th>Post neonatal</th>
<th>Total</th>
<th>IMR per 1000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Congenital abnormalities</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1.3</td>
</tr>
<tr>
<td>Prematurity</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>2.7</td>
</tr>
<tr>
<td>Delivery complications</td>
<td>1</td>
<td>4</td>
<td>5</td>
<td>6.7</td>
</tr>
<tr>
<td>Hypoxia &amp; birth asphyxia</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>6.7</td>
</tr>
<tr>
<td>Pneumonia</td>
<td>6</td>
<td>26</td>
<td>32</td>
<td>42.9</td>
</tr>
<tr>
<td>Malaria</td>
<td>6</td>
<td>39</td>
<td>45</td>
<td>60.3</td>
</tr>
<tr>
<td>Total</td>
<td>16</td>
<td>74</td>
<td>90</td>
<td>120.6</td>
</tr>
</tbody>
</table>
The main causes of infant death were pneumonia and malaria. Respiratory distress, infections, and accidents were considered although no case was reported.

**Adverse pregnancy outcome:**

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Neonatal</th>
<th>Post neonatal</th>
</tr>
</thead>
<tbody>
<tr>
<td>No adverse pregnancy outcome</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Preterm</td>
<td>1</td>
<td>7</td>
</tr>
<tr>
<td>Low birth Wt.&lt; 2.5Kg</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Post-term</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

χ² = 0.00 Significant

Nintyeight percent of the studied population with no adverse pregnancy outcome and there were few cases of the IMR related to adverse pregnancy outcome.

**DISCUSSION**

According to World Fact Book estimates 2009, the estimated annual number of the IMR among Sudanese households was decreased between 2003 and 2006, but it started to in the last three years (2007-2009), This elevation in IMR may be attributed to instability in some areas all over the country and lack of the access to health services in some peripheral areas in addition to limited implementation of Integrated Management of Childhood Illnesses (IMCI) program in different states.

The IMR in the administrative area is 120.6 deaths per 1000 live births, which is very high. The IMR in the rural area is about four times the IMR in the urban area.

The analysis of the IMR study in Abu Haraz Administrative Area, Shikan Locality, North Kordofan State reveals that the IMR is 25.4 death per1000 live births in the urban area and 95.2 death per1000 live births in the rural area. In1998; more than 50 countries including Sudan still had infant mortality rates of over 100 deaths per 1000 live births (7). This figure differs from the findings of Sudan Household Survey (SHS2006) that showed the IMR was 81 deaths per1000 live births; and exceeded the UNICEF estimates which was 69.4 deaths per 1000 live birth in 2009 compared to 81 deaths per 1000 live births in Nuba Mountains, West Sudan (2002) and 77deaths 1000 live births in Wad Medni town (2004). This may emphasize that the IMR varies substantially among different states within the country and the wide discrepancy indicates the need for stress on the problem cause to identify the solution and templement it.

Regarding the position of the households, the study showed that the rural area had a high rate of the IMR than the urban area and this was statistically significant (P value was 0.001). This could be due to the fact that urban areas had good infrastructures than the rural ones.

While infectious diseases continue to be major contributors to the infant mortality in developing countries as well as Abu Haraz Administrative area, congenital abnormalities, prematurity associated disorders, respiratory distress, birth complications, infections, and hypoxia or birth asphyxia account for no
significant percentage of the infant deaths in the study.
The study proved that pneumonia and malaria are the major causes of the IMR in the post neonatal period. This differs from the United State report in 2002 by Center of Disease Control [8].

**CONCLUSIONS:**
- The IMR was high in rural sector in Abu Haraz Administrative Area, Shikan Locality, North Kordofan State during 2009.
- The IMR in the locality was higher than Sudan estimates, 2009.
- The IMR in the locality is occurred more in post neonatal period.
- The causes of the IMR in the locality were variable and with multi dimensions, pneumonia and malaria represents the main causes of the IMR in the locality

**Acknowledgement:**
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**REFERENCES:**
1. World IMR (2008) (Global Social Change Reports Includes a report showing world trends in infant mortality)
4. mdgs.un.org/unsd
5. UNICEF(2003), State of the World's Children 2003 Infant Mortality Table
6. CIA World Factbook, last updated on April 2, 2009