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Factors associated with child morbidity amongst children 0-59 months in Mashonaland East, Zimbabwe: An Analytical cross sectional study

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Abstract: *Child morbidity and mortality due to preventable causes remains high in developing countries. Diseases like pneumonia can both be prevented and treated with low-cost intervention yet pneumonia remains the leading infectious cause of death for children below five years causing about 900 000 deaths per year.An analytical cross sectional design was conducted in 2 districts in Zimbabwe to determine factors associated with child morbidity. A sample of 672 mothers aged 18-49 years with at least one child below 4 years of age were selected through multi-stage cluster sampling and questionnaires were administered to them. The main outcome measure(s) for this study were factors associated with child morbidity.*

The study revealed that there was no association between child morbidity and birth weight (χ^2=72.58; p= 0.558); mother's age (χ^2=30.95; p=0.792) and marital status (χ^2= 2.98; p=0.562). A statistically significant association between child morbidity and: child age (χ^2= 69.08; p=0.03), religion (χ^2= 229.2; p= 0.00); mother's breastfeeding practice (χ^2=349.5; p= 0.01) and frequency of child feeding (χ^2=29.73; p= 0.005) was found. Literacy level of the respondents (OR=0.56; p= 0.015); length of exclusive breastfeeding (OR=1.13; P= 0.046); variety of good given to children (OR=0.65; P= 0.013) and the knowledge levels of the primary care-giver on good child caring practices (OR=1.02; P= 0.031) were statistically significant predictors of child morbidity.

The study recommended that governments should focus on the establishment of sustainable, effective community mobilisation systems that are integrated into the conventional health delivery system to reduce child morbidity and mortality due preventable causes.

Key-words: *Child morbidity; community mobilisation; child –care practice*

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I. Introduction

Worldwide,an estimated 5.6 million children still die before reaching their fifth birthday, 11 deaths per 1,000 live births occur in the post-neonatal period, mainly from conditions that are readily preventable or treatable with proven, cost-effective interventions(USAID, 2017). The leading causes of child morbidity in developing countries are pneumonia, diarrhoea, malaria, malnutrition and measles.

Sub-optimal breastfeeding still accounts for deaths of 1.4 million children below five years of age[1]. Over half of the world's children suffer from poor nutrition, and as a consequence they experience delays in physical, cognitive and mental development. Infant feeding choices affect both maternal and health outcomes worldwide[2]. Optimal infant and young child feeding, which includes initiation of breastfeeding within one hour of birth, exclusive breastfeeding for the first six months, age appropriate complementary feeding after six months along with continued breastfeeding for 2 years and beyond, is a public health intervention to prevent child morbidity, mortality and malnutrition[3]. Research has proven that community based infant and young child feeding practices can be effectively improved by enhancing access to education and counselling support systems at grassroots level.

A study in West Africa revealed that among the recommended complementary feeding practices, it was only the introduction of solid, semi-solid or soft foods that was adequate among children in all the West African countries surveyed[5]. Low rates of minimum acceptable diet were reported among children. The study made a recommendation that government and stakeholders of the countries studied make frantic efforts to improve the poor practices so as to reduce child morbidity and mortality. Intervention studies on complementary feeding should target the socio-demographic factors that pose risks to optimal complementary feeding[5].

Similarly, a case-control study was conducted in Nepal to identify causes for stunting (underlying cause of child morbidity and mortality) amongst children 6 to 59 months. The cases were stunted children and controls were the children without stunting[6]. The study revealed that socio-economic risk factors for stunting included mothers without earning ((OR=3.11, 95% CI 1.26-7.65), food deficit families (OR=4.26, 95% CI 1.73-10.45) and care taker of the children other than mother (OR=3.02, 95% CI 1.19-7.70)[6]. Inappropriate exclusive breast feeding (OR=6.90, 95% CI 2.81-16.97), complementary feeding less than four times a day (OR=3.60, 95% CI 1.32-9.95) and dietary diversity below WHO standard (OR=4.06, 95% CI 1.70-9.67) were factors of stunted children. Diarrhea was found significantly associated with stunting (OR=7.46, 95% CI 2.98-18.65). Stunting was found to be as a result of multiple factors such as socio-economic, environmental and inappropriate feeding practices[6].

Studies have shown that most causes of child morbidity and mortality can be effectively be addressed at community level by promoting simple interventions such as exclusive breastfeeding and continued breastfeeding for at least 2 years, preventing indoor air pollution through proper ventilation, promoting recommended infant and young child feeding practices, community screening and growth monitoring of children below five years and promotion of full vaccination of all children.

The Integrated Global Action Plan for the Prevention and control of Pneumonia and Diarrhoea(GAPPD) is a framework that was coined by the World Health Organisation to reduce childhood deaths from pneumonia and diarrhoea by seeking to protect child health through good health practices from child birth (WHO, 2015). Through the integrated Community Case Management (ICCM) approach which empowers community health workers on community health management, the GAPPD also seeks to support community treatment of childhood illness and prevent childhood illnesses.

There is limited evidence in Zimbabwe on the effects of scaling-up community based integrated prevention and management childhood illnesses programs on child health outcomes. This study sought to identify factors associated with child morbidity at among children 0-59 months in Mashonaland East province rural communities. This baseline information informed the designing and intervention package for a community cluster randomised-controlled trial that then followed which aimed at assessing the effect of a developed community mobilisation model in improving child health outcomes in the same study sites.

II. Materials and Methods

Study design, setting and participant

An analytical cross sectional design was employed in this study. The study was conducted in Mashonaland East in Zimbabwe. Mashonaland East has a total population of 1 371 989 people and of these 23.7% (324 543) are women of child bearing age and 209 579(15.3%) are children below 5 years of age[3]. Murewa district has a total population of 203 619 people and 14.9% (30 348) are children below 5 years. Murewa clinic has a total population of 25 131 people and of these, 3 694(14.7%) are children below five and 6 358(25.3%) are women of child bearing age. Women with at least one child below 2 years were selected and interviewed. Women with mental illnesses and those who were seriously ill were excluded.

Sampling

This study was a baseline survey for the purposes of ascertaining baseline characteristics for the participants who were being recruited for a cluster randomised trial to test the effectiveness of a community mobilisation approach in improving health outcomes. Thirty clusters were matched and assigned either to control or intervention group by stratified random sampling. Participants for this survey were then drawn from the randomised clusters.

Sample size calculation

This survey was nested in a cluster randomised control trial. The Cluster Randomized Control trial sample size was calculated in STATA 13 software. Assuming morbidity prevalence of 50% with a margin of error of 5% derived from the prevalence obtained by similar studies. A composite child morbidity prevalence of 50% assumed. This was derived from the summation of the prevalence of the selected top childhood illnesses in Mashonaland East namely pneumonia, diarrhoea, malaria, fever, malnutrition and anaemia. The prevalence was obtained from the Zimbabwe National Health Information System. The assumed intra-cluster correlation coefficient (ICC) of 0.05; level of significance, 5%; design effect of 2, 45 and Power of 0, 9. Firstly, assuming individual randomization the sample size per arm would be 121 subjects. Then, allowing for cluster randomization the sample size per arm became 330 mother-child pairs. Number of clusters per arm (m) for the study is 11 as determined from the software.

Using Dobson's formula the calculated sample size for the survey would be the 384 participants assuming that z, standardized normal distribution value for the 95% CI, which is 1.96, p=0.5, an estimate of prevalence of child morbidity in Mashonaland East and taking Δ, the margin of error to be 5.0%.

$n=z^2p\ (1-p)/\ \Delta^2 = (1.96)^2(0.5)(0.5)/(0.05)^2=384$. This means that a sample size of 384 study participants would be required.

However the study recruited 672 participants to approximate the study sample for the cluster randomised controlled trial since the other objective of the survey was to get baseline characteristics for the participants who were being recruited for the next phase.

Instrument

A survey questionnaire was used in this study. This questionnaire had questions partly adopted from UNICEF standardised questionnaires for infant and young child feeding and Zimbabwe Ministry of Health and Child Care sample questionnaires on maternal and child health. The questionnaire had five sections: the sociodemographic data section, maternal health, child health and knowledge and attitude section.

Validity and reliability of instrument

The questionnaire was assessed for content validity against set objectives by the 4 independent content experts from the University Of Zimbabwe College Of Health Sciences who volunteered to contribute in the study. The experts were requested to evaluate the relevance of each question/item in the study. The experts were requested to assess the relevance of each question/item in the instrument on a 4- point scale.

The questionnaire was evaluated for test-retest reliability with 10 people randomly selected at Kunaka rural health centre who were from non-participating villages. The test-retest assessments were 5 days apart. Participants were not told that they would be re-tested to minimise bias.

Item completion of the questions and percentage agreement between test–retest assessments was calculated for each question and it was above 90% for all questions. Based on these results the questionnaire was adopted for use in the study.

Statistical analysis

Data was analyzed in Statistical Package for Social Science (SPSS version 20.0) and Stata 13. Both descriptive and inferential statistics were used in data analysis. The study used chi square tests to check for the association between child morbidity and selected factors. Multiple logistic regression was then done assess the strength of association for those factors that had a statistical significant association with child morbidity. Interviews were conducted using structured questionnaires. Data collection was done between November 2016 and January 2017 by trained research assistants who were mid-wives by profession.

Ethical approval was sought and granted by the Joint Research Ethics Council for Parirenyatwa and the University of Zimbabwe (JREC reference number 111/16) and The Medical Research Council of Zimbabwe (MRCZreference number A/2099). Permission to conduct the research was also sought from respective local authorities, community leaders, religious leaders and representatives of the apostolic community, government authorities and the respondents themselves. Participants provided written informed consent and consent forms highlighted confidentiality and confirmed that the respondent's identity will remain anonymous. Participants were notified that they can terminate the interview at any given moment without questions or any negative consequences. Data storage was done in a manner to assure confidentiality and privacy. Study- related documents were kept under lock and key.

III. Results

3.1 Socio-demographic characteristics of the study

A total of 672 women with children 0-48 months were interviewed. The mothers' mean age was 28.0 years (SD=6.8), 95% C.I (27.4 -28.5). Children had a mean age of 18.2 months and a standard deviation of 4.0 95% C.I (17.2-19.3). The mean gestational age at delivery for the participating mothers was 39 weeks (SD=1.8). The mean number of children for the participating women was 2.6(SD=1.5). Household heads had a median age of 33.5 years (Q1=25; Q3=94). The mean length of exclusive breastfeeding was 5.8 (SD= 0.1), 95%C.I. (5.6-5.9) and the mean frequency of child feeding was 4.8 times (SD=0.14), 95% C.I (4.5-5.1). Table 1 below summarizes the socio-demographic characteristics of the study participants.

3.2 Association between child morbidity and selected factors

With regards to child morbidity, the study sought to ascertain the prevalence of child morbidity over the last month for the participating children. Study findings revealed that 247(33.8%) of children 0-48 months were diagnosed with at least one of 5 childhood illnesses the study was focusing on namely pneumonia; diarrhoea; malaria; malnutrition; anemia and fever.

Pearson's chi-square tests were done to measure the association between child morbidity and the selected factors. Of the selected socio-demographic variables; birth weight (χ^2=72.58; p= 0.558); mother's age

(χ^2=30.95; p= 0.792) and marital status (χ^2= 2.98; p=0.562) had no statistically significant association with child morbidity.

The place of delivery for the mother had a statistically significant association with child morbidity (χ^2= 674.72; p= 0.00). Similarly, child age was associated with child morbidity (χ^2= 69.08; p= 0.03). The study compared morbidity in children less than 24 months and those who were 24- 48 months and revealed that morbidity was higher in the latter group than the former. Child morbidity was also associated with care-giver literacy level (χ^2= 687.14; p= 0.00); religion of the mother (χ^2= 229.2; p= 0.00); whether the mother has ever breastfed (χ^2=349.5; p= 0.01); length of exclusive breastfeeding(χ^2= 24.06; p=0.04); Knowledge on child feeding practices(χ^2= 2 92.48;p= 0.00); frequency of feeding(χ^2=29.73;p= 0.005); variety of feeding (χ^2=412; p= 0.00) and decision making with regards to weaning(χ^2=27.9; p= 0.00).Decision to wean was also strongly associated with the HIV status of the mother (χ^2=77.45; p= 0.00).

Logistic regression was done as summarized in Table 2 for the statistical significant factors with an aim of determining the strength of these factors as predictors of child morbidity.

Multiple logistic regression revealed that only literacy level of the mother (OR=0.56; P =0.014); Length of exclusive breastfeeding (OR=1.13; P= 0.046); variety of feeding (OR=0.65; =0.013) and knowledge on child caring practices (OR=1.02; P = 0.031) were statistically significant predictors of child morbidity. The strongest predictor was variety of feeding; followed by literacy levels of the care-giver and the knowledge levels on child caring practices.

The study revealed that 482(71.7%) of the participants had reached at least ordinary level. Literate primary care-givers were 0.56 times likely to have a child reported ill in the previous month (p=0.015; 95% C.I. (0.35-0.89). Shorter duration of exclusive breastfeeding was associated with higher likelihood of child morbidity (OR=1.13; p= 0.046; 95%C.I (0.92-0.98). Similarly, dietary diversity was a critical determinant of child morbidity. Children with a mean dietary diversity score above 4 were 0.65times likely to be reported ill when compared with those whose mean dietary diversity score was less than 4(P= 0.013; 95%C.I(0.38-0.89). Children born to mothers with poor knowledge on child caring practices were more likely to get ill compared to those whose mother had good knowledge on child caring practices (OR=1.02, p= 0.031; 95%C.I (0.44-0.93).

IV. Discussion

4.1 Socio-demographic data

The aim of the study was to determine the factors associated with child morbidity. A total of 672 women with children 0-48 months participated in the study. The mean mother's age was 28.0 years (SD = 0.26) and the mean child age was 18.2 months (SD = 0.54).The study revealed that 589(87.5%) of the household heads were men.

The study revealed an improvement in the choice of place of delivery amongst women in Mashonaland East. The latest Zimbabwe demographic health survey revealed that institutional deliveries in Mashonaland East constitute 71.2% of the deliveries[4]. This study found out that only 12.2% (81) of the women had delivered at home. Home deliveries pose great risk to child survival especially at neonatal age.

With regards to literacy, 71.7% (452) of the participants had at least reached ordinary level and 570(84.8%) were married. The predominant religion were the Apostolics 270(40.2%) and the protestants 29.8% (200), followed by mainline churches 134(19.9%) and other religions 68(10.1).

4.2 Predictors of child morbidity amongst children 0-59 months

The study sought to measure the association between selected independent factors and child morbidity. Pearson's chi square test revealed that there was no significant association between child morbidity and birth weight (χ^2=72.58; p=0.558); mother's age (χ^2=30.95; p= 0.792) and marital status (χ^2= 2.98; p= 0.562). The researchers had assumed that like what some few studies in Africa had found out, there will be a significant association between the mother's age and child morbidity since there is a marked difference in child feeding practices amongst older and young mothers in developing countries. However, it seems in Zimbabwe this position has changed due to the high literacy levels. This could also be partially supported by the fact that these participants were relatively young mothers, hence we expect them to be in touch with the current realities in child care. Being single has often been associated with poor child health outcomes owing to the inability of mothers to maintain a balanced diet due to socio-economic challenges. The association between marital status in this study could have been rendered insignificant by the imbalanced proportions between married (84.8%) and single mothers (7.8%).

The place of delivery for the mother had a statistically significant association with child morbidity (χ^2= 674.72; p= 0.00). Mothers who delivered at home were more likely to have children with neonatal complications and frequent dangers of childhood illnesses. This means that delivering at home remains a risk factor for both maternal and child morbidity. Similarly, child age was associated with child morbidity (χ^2= 69.08; p= 0.03). Compared with children below 24 months, children above 24 months were more likely to get sick and more

likely to visit the clinic. This could be explained by the fact that mothers stop breastfeeding at 24 months or earlier in line with the recommended infant and young child feeding practices. Weaning at 24 months results in a sudden change in the young child's nutrition since most families afford an average of 2-3 meals a day for every household member due to high levels of poverty. This frequency of feeding falls far below the recommended frequency and adequacy of feeding for children 24- 48 months and may result in a weakened immune system in these children making them more prone to diseases.

Children who were not exclusively fed for the first 6 months and those who were bottle fed were also more likely to get ill than their counterparts. It is then imperative to also continuously create public awareness about the dangers of bottle, early initiation of solid foods and formula feeding and to provide accurate information on the age appropriate complementary food to be given to infants. Governments in developing countries need to make serious efforts to overcome malnutrition and other forms of child morbidity through effective implementation of Infant and Young Child Feeding policies[3].

Child morbidity was also associated with care-giver literacy level (χ^2= 687.14; p= 0.00); religion of the mother (χ^2= 229.2; p= 0.00); whether the mother has ever breastfed or not (χ^2=349.5; p= 0.01); length of exclusive breastfeeding (χ2 =24.06; p= 0.04); Knowledge on child feeding practices (χ2=2.48;p=0.00); frequency of feeding (χ^2 =29.73;p= 0.005); variety of feeding (χ^2 =412; p=0.00) and decision making with regards to weaning (χ^2 =27.9; p= 0.00). Decision to wean was also strongly associated with the HIV status of the mother (χ^2 =77.45; p=0.00). This study revealed that 402 (53.7%) of the study participants had exclusively breastfed their children for the recommended 6 months. These findings are similar to those in a study on the duration of exclusive breastfeeding and subsequent child feeding adequacy in Ghana reported 66% being mothers who had exclusively breastfed their children.

Logistic regression was then done to check the statistical significance of predictors of child morbidity. The study revealed that 482(71.7%) of the study participants reached at least ordinary level of education. Primary caregivers who had not reached ordinary level had 0.56 times likelihood of having an ill child as compared to the more literate ones. This meant that formal education was a protective factor to child health. These findings confirm the results of a similar study conducted in Northern East Vietnam. High literacy among mothers led to good breast-feeding practices and low mortality due to diarrhoea, malaria, and measles[8].

Of the 672 participants 403(60%) reported having exclusively breastfed their children, for 6 months as per the World Health Organisation recommendations. This is 12% higher than what the Zimbabwe Demographic Health survey (ZDHS) report of 2015 indicated as the national prevalence of exclusive breastfeeding[4]. This study revealed that exclusive breastfeeding for a shorter period increased the likelihood of child morbidity by 1.13 times when compared to outcomes for longer duration. Supplementing breast milk before 6 months increase the risk of diarrhoeal diseases and stunting. Twenty seven percent of Zimbabwean children are stunted and the hardest hit age group is the 24-35 months which has a stunting prevalence of 39% and it is lowest in children 6- 8 months which confirms the fact that exclusive breastfeeding is critical for child growth, health and development[4].

Mean dietary diversity score has been proven by research to determine the nutritional status and health outcomes amongst children 0-59 months and even adults. In line with the World Health Organisation nutritional guidelines; food given to children was classified into 7 groups namely carbohydrates; green vegetables; yellow vegetables; fruits; animal and vegetable protein; dairy products and fats. Of the 672 participants; 450(67%) were giving their children a weekly diet comprising of one food group and in this case it was mostly carbohydrate based; 93(13.8%) were giving food falling into two food groups; 40(6%) 3; 10(1%) 4; 5(0.5%) 5; 74(10.9%) 6 groups. It is recommended that breastfed children 6- 23 months be given foods from four or more food groups daily. The mean child age for the study was 18.2 months (SD=0.54) meaning to say that the expected frequency of complementary feeding was at least 4 and the expected daily and weekly food diversity being at least 4 groups of foods. This variable was dichotomized for logistic regression. Children with a mean dietary diversity score above 4 were 0.65 times likely to be reported ill when compared with those whose mean dietary diversity score was less than 4(P= 0.013; 95%C.I(0.38-0.89). The findings on minimum acceptable diet are comparable with the ZDHS, 2015 report that indicated that in Zimbabwe, only 8% of children 0-23 months consume an acceptable[4]. This means that a lot is still to be done in educating mothers especially from the rural areas on the importance of continued breastfeeding for at least 24 months and age appropriate complementary feeding to reduce the chances of child morbidity.

Children born to mothers with poor knowledge on child caring practices were 1.02 times likely to get ill compared to those whose mother had good knowledge on child caring practices (p= 0.031; 95%C.I (0.44-0.93). The study findings are in line with what Van found out in a survey on child morbidity and mortality in Vietnam. In this study lack of information was the main cause of vaccination failure and child morbidity[8]. Mothers have the right to health education and it is the mandate of health practitioners to meet the right.

4.3 Limitations

The study being a cross sectional study could only measure association between independent factors and child morbidity. Further research with the use of interventional study designs is critical for the assessment of causal relationships so that child health programs are informed by empirical evidence.

V. Conclusion

The study findings revealed that there is an association between child age, religion and frequency of child feeding; Results also showed that literacy level of the respondents; length of exclusive breastfeeding; variety of good given to children and the knowledge levels of the primary care-giver on good child caring practices are statistically significant predictors of child morbidity. It is then evident from these findings that better child health outcomes, are only possible if governments and stakeholders in health focus on the establishment of a sustainable, effective community health system for community mobilisation. Such a system need to be integrated into the conventional health delivery system so as to continuously empower mothers at grassroots level on good child health and nutrition practices. In the long run communities take ownership and accountability of their health and that of their children yielding better health outcomes and greater chance for child survival.

LIST OF ABBREVIATIONS

CI - Confidence Interval
ICC - Intra-cluster Correlation Coefficient
JREC - Joint Research Ethics Council for Parirenyatwa and the University of Zimbabwe
MRCZ - Medical Research Council of Zimbabwe
OR - Odds Ratio
SPSS – Statistical Package for Social Sciences
WHO - World Health Organisation
ZDHS - Zimbabwe Demographic Health Survey

DECLARATION

Ethics and approval to participate

We confirm that this study received an Ethical approval from the Joint Research Ethics Council for Parirenyatwa and the University of Zimbabwe (JREC) and The Medical Research Council of Zimbabwe (MRCZ) MRCZ/A/2099. Permission to conduct the research was also sought from respective local authorities, community leaders, religious leaders and representatives of the apostolic community, government authorities and the respondents themselves. Participants provided written informed consent and consent forms highlighted confidentiality and confirmed that the respondent's identity will remain anonymous.

Consent to publish: N/A

Availability of Data and material

The data set used and /or analyzed during the current study is available from the corresponding author on reasonable request.

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

MM: Conception, design, acquisition, analysis and interpretation of data and drafting the manuscript. MZ, LG and BS: Supportive supervision and mentorship from conception, design, data collection, analysis, interpretation and reviewing of several drafts of the manuscript for important intellectual content.

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