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Impact of Common Mental Disorders on Food Insecurity among Women in Butajira, Ethiopia: A Cohort Study

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Abstract

Background: There is a growing body of evidence for an association between common mental disorders and food insecurity. However, since most studies have been cross-sectional, it has not been possible to differentiate the direction of the association. The aim of this study was to determine the effect of common mental disorders on food insecurity using a prospective cohort study design.

Methods: The study was carried out in Butajira, south-central Ethiopia among mothers who were enrolled in the CMaMiE cohort. A total of 1815 enrolled women were evaluated for symptoms of CMD using the Self-Reporting Questionnaire-20 (SRQ-20) at two time points; August 2012 (time 1, T1) and in August 2014 (time 2, T2). Probable CMD was defined when mothers reported six or more affirmative (yes) responses to the SRQ-20. Household food insecurity was measured using the Household Food Insecurity Access Scale (HFIAS) in December 2017 (time 3, T3). Zero inflated negative binomial regression was used to determine the independent effects of CMDs at T1 and T2 on food insecurity score at T3. A Poisson working model was used to determine the risk of being severely food insecure associated with CMD.

Results : About two thirds of women (67.0%) were living in food insecure households.The prevalence of CMD was 4.8% at T1 and 10.0% at T2 and only 1.2 % (n=22) women had CMD at both time points. After controlling for potential confounders, women with CMD at T2 only (RR=1.14; 95%CI: 1.02, 1,29) had higher HFIAS scores at T3; Women with CMD at T1 only were not significantly associated with HFIAS score at T3. Women with CMD at T1 only had 4 times higher risk of severe food insecurity (RR=3.96, 95% CI: 2.15-7.27) and women with CMD at T2 only had 2.2 times higher risk of severe food insecurity (RR=2.24, 95% CI: 1.27-3.95) at follow-up.

Conclusion : Common mental disorders among mothers were prospectively associated with increased risk of household food insecurity in this rural Ethiopian population. Possible mechanisms such as increased cost for health care, lost productivity and decreased self-efficacy warrant further investigation for their potential to prevent future food insecurity.

Introduction

Common mental disorders (CMDs) are characterized by a combination of somatic, anxiety and depressive symptoms (1).In a systematic review and meta-analysis of perinatal CMDs in low- and middle-income countries (LMICs), 15.6% and 19.8% of women had antenatal and postnatal CMDs, respectively (2). Furthermore, in a Multi-country study carried out in India, Vietnam, Peru and Ethiopia the prevalence of maternal CMD was high, ranging from 21% in Vietnam to 33% in Ethiopia(3). In a study carried out amongst women in a rural Ethiopian community, the prevalence of CMDs during pregnancy and postnatally were 12% and 5%, respectively (4).

Maternal CMD has important public health implications, for both the mother and child(5). In a systematic review, maternal depression was associated with being underweight and stunted in early

childhood(6).Individual studies have found that maternal CMD negatively affects child health and development(7, 8).In Ethiopia, there is mixed evidence regarding the association between maternal CMD and child health and development outcomes. In some Ethiopian studies, maternal CMD is associated with increased risk of infant under-nutrition (9, 10), diarrhea and acute respiratory infections (11), and child mortality (12). In one study in rural Ethiopia, poorer child development was associated with maternal depression(13). However, in other studies from Ethiopia, there was no association between perinatal CMD and child survival and development (14, 15).

The Eastern African sub region is home to one of the world's largest populations of undernourished people; an estimated 124 million people(16). Individual studies in Ethiopia reported as high as 80% prevalence of household food insecurity (17, 18). Although Ethiopia has made significant progress in reducing undernutrition, a considerable proportion of children (38%) remains stunted(19).

Achieving food security and promoting mental health are targets of the United Nations Sustainable Development Goals(20).. There is accumulating evidence for a positive association between CMD and food insecurity(21). In a systematic review of 16 studies linking food insecurity and mental health in LMICs, there was a significant association between food insecurity and common mental disorders(22). Similarly, in individual cross sectional studies conducted in Ethiopia, a significant association between mental distress and household food insecurity has been reported(16, 18, 23). In reviews of studies of poverty and depression in LMICs, it is predicted that poverty will be a risk factor for CMD, with less likelihood of CMD leading to poverty (24). However, as most of these studies are cross-sectional surveys, it has not been possible to differentiate the direction of the association i.e. whether food insecurity resulted in mental illness or vice versa.

Indications of the nature of the specific association between CMD and food insecurity are available from studies conducted in high-income countries. In a longitudinal study conducted in the US, maternal depression during the postpartum year was strongly associated with child and family food insecurity 3–15 months later (25).Furthermore, another study conducted in US indicated a bidirectional causal relationship between household food insecurity and depression(26).

In the present study, we hypothesized that maternal CMDs would increase the subsequent risk of household food insecurity in a low resource setting.

Materials And Methods

Study settings

The study was conducted in and around Butajira town, which is located 135 km south of Addis Ababa, the capital city of Ethiopia. The Butajira Health and Demographic Surveillance Site (HDSS) is one of the oldest surveillance sites in Africa, established in 1986. It consists of nine rural and one urban kebeles (lowest administrative area) from different ecological zones. The livelihood of the residents is based on

subsistence farming. Khat (Catha edulis Forsk) and chili-peppers are the main cash crops, while maize and “false banana” or ensete (Ensete ventricosun) are the main staples(27).

The current study was conducted among mothers who were enrolled in the CMaMiE cohort in the Butajira HDSS(28). The CMaMiE project is a population-based prospective cohort of women (n = 1065), established in 2005/2006 with the aim of estimating the public health impact of perinatal CMDs. When the birth cohort reached 6.5 years, children born 12 months before (n = 572) and 12 months after (n = 773) the original CMaMiE recruitment period were identified through the HDSS birth records. Surviving children, together with their mothers, were recruited into an expanded cohort. Data of 1815 mothers who were under expanded cohort follow up at 6.5 years (considered as time 1 (T1) for the current study) and 7.5 years (considered as time 2; T2) were included in the current analysis. The last time point data (time 3; T3) were collected at 10.8 years (November 2017-January 2018) to assess household food insecurity as an outcome.

Study Design And Power

A prospective cohort study design was employed using the C-MaMiE cohort. CMDs measured in August 2013 (T1) and in August 2014 (T2 were used to predict household food insecurity at T3 (3 years and 4 months after T2 and 4 years and 4 months after T1). Power of the study to evaluate the adequacy of the sample to answer the present research questions was calculated using OpenEpi software and it was found to be adequate (> 80%). (https://www.openepi.com)

Measurements

Household food insecurity was measured using the9-item (0 = No, 1 = Yes) Household Food Insecurity Access Scale (HFIAS), which was validated previously in Butajira, Ethiopia(29). Affirmative answers to each question are followed by the frequency of occurrence (1 = rarely, 2 = sometimes and 3 = often). The minimum and the maximum expected score is 0 and 27, respectively. The HFIAS items assess an experience of food insecurity (access) occurring within the previous four weeks. A household is considered as severely food insecure if the household “often” reduces meal size or the number of meals, and/or experiences any of the three most severe conditions (running out of food, going to bed hungry, or going a whole day and night without eating), even only “rarely”(30). We modeled HFIAS in two different ways (a) as count using Zero inflated negative binomial and (b) as binary outcome using Poisson working model. We dichotomized food insecurity as severely food insecure and not severely food insecure (food secure, mild and moderate food insecure combined).At T1 and T2, women were asked whether they had experienced hunger in the past month due to lack of food (single item), while the full food insecurity measure was collected at T3.

CMD was measured using the self-reporting questionnaire (SRQ-20), which was also validated in Ethiopia(31). The 20 items ask about depression, anxiety and somatic symptoms in the preceding four

weeks. Women with six or more affirmative (yes) responses were considered to have CMDs. CMD is the primary exposure variable in the current study.

A living standard score was constructed with the following six variables: ownership of a business, bed and radio, availability of a latrine and sanitary means for disposal of rubbish and having a window within the home. One point was given for each item with the total minimum score of zero and maximum score of six. A hierarchical living standard scale of these six items was confirmed in the same cohort using Mokken analysis (Loevinger H coefficient 0.45)(32).

Data analysis

Data were collected using tablets installed with Open Data Kit (ODK). We analyzed the data using STATA software version 14. Descriptive analyses such as frequency, mean and median, were used to describe the profile of study participants in terms of socio-demographic, economic, food insecurity and CMDs status.

Univariate and multivariable analyses were carried out to assess the effects of CMDs at T1 and T2 on HFIAS score at T3. As the mean HFIAS score was significantly ($p < 0.001$) different from the variance, violating the assumption of Poisson probability distribution (i.e. over-dispersion), we preferred a negative binomial regression model that has an additional parameter to take account of extra variability. Finally, because zeros appeared to be inflated, we used zero inflated negative binomial regression model (zinb command in STATA). We also did test for trend across exposure time points. As a secondary analysis, we estimated the risk ratio for association between CMDs at T1 only and at T2 and severe food insecurity using a Poisson working model with model-robust sandwich estimators(33).

Results

Selected characteristics of the cohort at T1 are presented in Table 1.The mean age of women and their husbands were 34 years (Standard Deviation (SD) 6.4) and 43 years (SD9.0) years, respectively. Most women (82%), but less than half of husbands (42%),had no formal education. About 15% of women were in polygamous marriages. Hunger in the last month was reported by 7% of the women.

Table 1
Socio demographic and economic characteristics of the study participants at baseline, August 2012.

Characteristics	Number	Percentage or mean (SD)
Age of mother (years)	1754	34 (6.4)
Age of husband (years)	1,683	43 (9.0)
Educational status of mother	1447	82.5
No formal school	268	15.3
Primary	39	2.2
Secondary		
Educational status of husband	709	42.1
No formal school	856	50.9
Primary	94	5.6
Secondary	24	1.4
Further education		
Marriage type	1,417	80.8
Monogamous	268	15.3
Polygamous	69	3.9
Divorced or widowed		
Relative wealth	548	31.2
Less	64	3.7
More	1,142	65.1
Same		
Emergency resources	1,051	59.9
Has emergency resources	703	40.1
No emergency resource		
Hungry in the last month	1,634	93.2
No	120	6.8
Yes		

Characteristics	Number	Percentage or mean (SD)
Adequate family support	291	16.6
No	1,463	83.4
Yes		

Prevalence Of Cmd And Food Insecurity

The prevalence of CMDs was 4.8% at T1 and 10.0% at T2. Only 1.2% (n = 22) mothers had CMD at both T1 and T2.

At T3, 33.0% of households were food secure, 32.8% mildly food insecure, 29.0% moderately food insecure, and 4.6% severely food insecure

Association Between Cmd And Food Insecurity

The effects of CMD at T1 and T2 on HFIAS score at T3 among mothers is shown in Table 2. In the final adjusted model, those mothers who met criteria for a CMD at T1 only did not have a significantly greater HFIAS score compared to those who did not (RR = 1.07, 95% CI:0.90, 1.29). However, mothers who met criteria for CMD at T2 had significantly higher HFIAS scores at T3(RR = 1.14, 95%CI 1.02,1.29).

Table 2
The effect of CMD at different time point on HFIAS score at T3 among mothers in Butajira, Ethiopia.

Model	CMD status at different time	IRR	Trend (P value)	[95% Conf. Interval]
Model 1: Unadjusted (n = 1,804)	No CMD at both T1 and T2	1	0.001	1
	CMD at time one (T1) only	1.14		(0.96, 1.37)
	CMD at time 2 only (T2)	1.19		(1.06,1.34)
Model 2:Adjusted for hunger at T1 (n = 1,745)	No CMD at both time (T1 and T2)	1	0.001	1
	CMD at time one (T1) only	1.11		(0.93,1.33)
	CMD at time 2 only (T2)	1.19		(1.06,1.34)
Model 3: Adjusted for socio-demographic variable and hunger at T1	No CMD at both time (T1 and T2)	1	0.002	1
	CMD at time one (T1) only	1.13		(0.94,1.35)
	CMD at time 2 only (T2)	1.19		(1.06 1.34)
Model 4:Adjusted for economic variable and hunger at T1 (n = 1,745)	No CMDat both time (T1 and T2)	1	0.007	1
	CMD at time one (T1) only	1.06		(0.89,1.26)
	CMD at time 2 only (T2)	1.14		(1.02,1.28)

** Model 3 is adjusted for age of mother, age of husband, educational status of the mother, educational status of husband, marital status of mother, and hunger at T1

** Model 4 is adjusted for living standard, emergency saving, relative wealth, and hunger at T1

** Model 5 is adjusted for frequency of family visits, friend visits, family help, and hunger at T1.

** Model 6is the final model adjusted for all the variables mentioned from model 2 to 5.

Model	CMD status at different time	IRR	Trend (P value)	[95% Conf. Interval]
Model 5:Adjusted for social support and hunger at T1 (n = 1,745)	No CMDat both time (T1 and T2) CMD at time one (T1) only CMD at time 2 only (T2)	1 1.11 1.19	0.001	1 (0.93,1.33) (1.06, 1.35)
Model 6: fully adjusted (n = 1,675)	No CMDat both time (T1 and T2) CMD at time one (T1) only CMD at time 2 only (T2)	1 1.07 1.14	0.014	1 (0.90, 1.29) (1.02,1.29)
** Model 3 is adjusted for age of mother, age of husband, educational status of the mother, educational status of husband, marital status of mother, and hunger at T1				
** Model 4 is adjusted for living standard, emergency saving, relative wealth, and hunger at T1				
** Model 5 is adjusted for frequency of family visits, friend visits, family help, and hunger at T1.				
** Model 6is the final model adjusted for all the variables mentioned from model 2 to 5.				

Considering food insecurity as a categorical measure, after adjusting for possible confounders, those mothers who met criteria for a CMD at T1 had 4 times higher risk of being severely food insecure at T3 (IRR = 3.96, 95% CI: 2.15–7.27). Moreover, mothers with CMDs at T2 only had 2.2 times higher risk of being severely food insecure at T3 (IRR = 2.24, 95% CI: 1.27–3.9

Discussion

The present study employed a large prospective cohort study to evaluate the effect of maternal CMDs on household food insecurity in southern Ethiopia. We used locally validated measures for measuring both CMDs and food insecurity. After adjustment for a range of important potential confounders, women with CMDs had a significantly higher risk of scoring higher on a household food insecurity index and reporting severe food insecurity, independent of other poverty indicators such as experience of hunger at baseline, relative wealth, living standard and emergency savings.

In a number of studies in LMICs, a positive association between food insecurity and CMDs has been observed(16, 21, 23, 34–36). The major limitation of the existing evidence base is that all studies were cross sectional in design and was not, therefore, possible to examine whether CMDs longitudinally predict household food insecurity or vice versa.

Consistent with our finding, in a few studies from the USA, CMDs predicted household food insecurity using longitudinal data. A study showed maternal depression during the postpartum year was strongly associated with child and family food insecurity 3–15 months later (25). Another study from rural families in the USA showed a bidirectional relationship (26).We found that the social selection hypothesis (increased risk of poverty among people with mental health problems) is also relevant to CMDs.

Social causation and social selection (social drift) are the main causal theories that elucidate the association between poverty and mental ill health(37).The social causation theory states that poor socioeconomic conditions cause poor mental health. On the other hand, the social selection theory claims that poor mental health causes individuals to experience poorer socioeconomic conditions. In a systematic review, poverty (particularly low education, food insecurity and financial stress) predispose to CMDs, which supports the notion that the social causation hypothesis is more relevant to CMDs (24). However, we found that the social selection hypothesis may also be relevant to CMDs. A longitudinal study found that both social selection and social causation may operate simultaneously by trapping people in a vicious cycle of poverty and poor mental health(38).

Various mechanisms may explain why CMDs are prospectively associated with food insecurity. Decreased productivity due to absenteeism from work, reduced productivity at work, lack of motivation or poor relationships at work, as well as increased health care costs may explain the association(39–41). A strong link between poor mental health and absenteeism from work and reduced on-the-job productivity (presenteeism) was found in a prior study(42).Most of the women in our study were unemployed housewives, but even so play a pivotal role in agricultural production such as crop production activities of weeding, harvesting, post harvesting, and storing crops (43). In addition, women are primarily responsible for livestock management such as milk processing and caring for newborn animals. Furthermore, their role in marketing agricultural products and purchasing foods and other commodities is substantial.

The vicious cycle of poverty and mental health implies that multisectoral responses are needed. In a systematic review, interventions to address CMDs had favorable effects on economic status(24).There is emerging evidence from LMICs that interventions that target the social selection pathway are promising, and supports the call for scale-up of mental health services in LMICs (44). Therefore, Interventions that target both social selection and causation pathways have potential to achieve a dual benefit of better mental health outcomes and poverty reduction

The present study should be understood within the context of the following limitations. We did not exclude or account for food insecurity at baseline (T1). Controlling for maternal self-reported experience of hunger at T1 might not address this limitation, as food insecurity is a broader concept that measure access to food. In addition, although we accounted for multiple potential confounders, residual confounding, for example by socio-economic status, might affect our finding

Using a longitudinal study design is the major strength of this study. The present study design helped us to potentially minimize the problems of reverse causality that would have been the case in cross

sectional studies. In addition, using locally validated tools to measure CMDs and food insecurity (HFIAS) are further important strengths of the present study

Conclusions

In a predominantly rural setting of Ethiopia, we found that common mental disorders (CMDs) were prospectively associated with increased risk of household food insecurity. Possible mechanisms such as increased health expenditure, reduced productivity, lost employment, reduced social support, decreased self-efficacy, and stigma warrant further investigation for their potential to prevent future food insecurity in resource limited settings of both rural and urban context.

Declarations

Ethical approval and consent to participate

Ethical clearance was obtained from the Institutional Review Board of Addis Ababa University, College of Health Sciences and the Research Ethics Committee at King's College London. Written informed consent was obtained from study participants. Women with high CMD scores were referred to local mental health care and supported to attend with payment of transport costs.

Consent for publication: Not applicable

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

Competing interest

The Authors declare that they have no competing interests

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Authorship

The first author developed the research idea and led the data collection process at time three. All authors contributed in designing of the study, participated in the data analysis and critically reviewed the draft manuscript. All authors read and approved the final manuscript

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