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Investigating incidence and association between poverty and maternal common mental disorders, in a population-based cohort of pregnant women, C-MaMiE study, Butajira, Ethiopia: retrospective cohort study

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ABBREVIATIONS and ACRONYMS

BRHP	Butajira Rural Health Program
CDS	Child Development Study
C-MaMiE	Child outcomes in relation to Maternal Mental disorders in Ethiopia
CMDs	Common Mental Disorders
DSSs	Demographic and Surveillance Sites
EDHS	Ethiopian Demographic and Health Survey
FMOH	Federal Ministry of Health
GAP	Gap Action Program
GBD	Global Burden of Disease
HICs	High Income Countries
LMICs	Low and Middle Income Countries
MGDs	Millennium Development Goals
mhGAP	Mental Health Gap Action Programme
MPI	Multidimensional Poverty Index
PPP	Purchasing Power Parity per day
PYO	Person-Years Observation
OR	Odds Ratio
SES	Socio-Economic Status
SNNPR	Southern Nations Nationalities and Peoples Region
SSA	Sub-Saharan Africa
UNDP	UN Development Program
WHO	W orld Health Organiz ation

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DEDICATION

This thesis work is dedicated to my mother W /ro Abeba Haile who has been the source of inspiration, engine and the secret for all of my achievements through all aspects of my life and without her scarification I would not have been reached to this stage.

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ABSTRACT

Background

Maternal Common Mental Disorders (CMD), including depression and anxiety, are recognized to have important public health consequences in low- and middle-income countries (LMICs). In Ethiopia, maternal CMDs have been associated with increased infant diarrhea, impaired child development and increased child mortality. Cross-sectional studies show associations between poverty and maternal CMD in LMICs, but the temporal relationship is unclear.

Objectives: the aim of this study was to investigate the association between poverty and maternal CMD, to assess incidence of poverty and maternal CMD.

Methods: a retrospective cohort study design was conducted. The C-MaMiE study recruited pregnant women (aged 15 – 49 years). CMD has been measured using WHO's Self-Reporting Questionnaire. Poverty was constructed using Mokken scaling procedure during pregnancy and having two or more subjective poverty report at the follow up time. Poisson and binary logistic regression analyses were performed.

Results: Incidence rates of poverty and CMD were 73.39 (95% CI: 51.90 - 103.79) and 35.38 (95% CI: 29.11 - 42.99) per 1000 person-years of observation respectively. However, this was not statistically significant. This study revealed that there was no statistically significant (OR: 1.15, 95% CI: 0.68 – 1.95) effect of maternal CMD upon poverty but it was found effect of poverty upon CMD (OR: 1.53, 95%CI: 1.02 – 2.31) . Husbands' primary education school (OR: 0.64, 95% CI: 0.44 - 0.94) and secondary and above (OR: 0.31 95% CI: 0.15 - 0.64) and poor social support (OR: 1.70, 95% CI: 1.06 - 2.75) were predicators of poverty. Polygamous marriage (OR: 0.54, 95% CI: 0.32 – 0.92), age group of 24 – 34 years (OR: 1.69, 95% CI: 1.11 – 2.57), and maternal health problem (OR: 2.16, 95% CI: 1.40 – 3.33) were predicators of CMD.

Conclusion and Recommendations: there was no significant effect of CMD upon poverty. On the other way round, there was statistically significant effect of poverty on CMD. Husbands' educational level and poor social support were predicators of poverty. Polygamous marriage, age and physical-ill health were predicators of CMD. The relationship among maternal mental health, physical-ill health and poverty could be addressed, this linkage should be brought to the attention of policy makers in the rural settings and further research is required to investigate maternal CMD leads to poverty causality using standardized and valid poverty measure.

1 . INTRODUCTION

1.1 Background

W omen are the backbone of a society and vanguard of the family welfare. However, because of their compromised and marginalized status, women receive the least benefits from societal and family resources. Especially women in developing countries suffer a lot from unfavorable conditions due to underdevelopment, traditional and cultural sanctions and poverty among other things (1 , 2).

The World Health Organization (WHO) defines maternal mental health as ‘‘a state of wellbeing in which a mother realizes her own abilities, can cope with the normal stresses of life, can work productively and fruitfully and is able to make a contribution to her community’’ (3). Mental health could well be an important addition, as poor mental health directly affects well being (4).W omen’s mental health and empowerment are critical to achieving sustainable progress in areas of socioeconomics, government policies and in the cultural environment which enables women to engage in and sustain the development process. As one can easily conclude, mental health is integral to maternal health, child health, and education (2).

Generally, mental illness comprised 1 3 % of the total global burden of disease (GBD) in 2 0 0 0 – a figure that is expected to rise to 15% by the year 2020 (5); the prevalence of CMD in the general population and particularly depression in women in LMICs are higher, in the range of 10 -41% and 18% - 25%, res pectively compared to High Income Countries (HICs), 10 -15% (6). Specifically, depression is the third leading cause of disease burden worldwide; representing 4 .3 % of total disability adjusted life years, and predicted to become the second leading cause of the global disease burden by the year 2 0 2 0 (5).

Common mental disorders (CMD), which include depression, anxiety and somatoform disorders, make a significant contribution to the burden of disease and disability in LMIC (7). It contributes to 7 % of the total of this burden, for women of all ages (8 , 9).

Definitely, not only is mental health relevant to many of the health-related Millennium Development Goals (MDGs) (10), but also to social and economic development (MDGs 1, 2 and 3) (7); specifically, MDG 1 : Eradicate Extreme Poverty and Hunger, MDG 2 : Achieve Universal Primary Education, MDG 3 : Promote Gender Equality and Empower W omen, MDG 4 : Reduce Child Mortality, MDG 5: Improve Maternal Health, Mental Health and MDG 6: Combat HIV/AIDS, Malaria and Other Diseases (8).

Despite newly introduced policy instruments and legislative commitments designed to serve women's interests, Ethiopia remains one of Africa's most tradition-bound societies. A vast majority of Ethiopian women, particularly in rural areas, live in a state of poverty and dependence, and rarely benefit directly from development initiatives (2). In Ethiopia, mental illness is the leading non-communicable disorder in terms of burden. Indeed, in a predominantly rural area of Ethiopia, mental illness comprised 11% of the total burden of disease (5).

Maternal depression is common in the rural Ethiopian women with a prevalence of 4. 8 % (5 , 11). A study from Butajira, Ethiopia found that the prevalence of CMDs were 12% in pregnancy and 4 .6 % in the postnatal period (1 2). Evidence shows that impact of mental illnesses in Ethiopia is significant, including suicide (completed) and suicide attempt were 7 .7 /1 0 0 0 0 0 /year and 3 .2 % , respectively (5).

The association between mental health and poverty is fundamental and its relationship is multifaceted and multidimensional (1 3). Although the Ethiopian National Mental Health Strategy recognizes the strong interconnections between mental illness and poverty (5); evidence is accumulating to guide intervention, focused on integrating mental health care into routine maternal and child health care through a task sharing approach (1 4); however, maternal mental health, including CMD has not become a component of the primary health care system in many parts of the LMICs. Therefore, the aim of this study was to investigate the association between poverty and maternal CMD, to assess incidence of poverty and CMD. The hypothesis was that maternal CMD was lead to onset of poverty rather than vice verse.

1.2 Statement of the problem

The systematic literature review indicates that the social and economic conditions of poverty are linked with CMD in LMICs (7). Maternal CMDs are recognized to have important public health consequences in LMICs. Recently, a series of studies have demonstrated that the impact of mental health problems in pregnant women, and up to one year after childbirth, include lower infant birth weight, higher rates of malnutrition and stunting in six-month-old infants (15), higher rates of diarrheal disease and infectious illness (8, 16) and suicidility thoughts or actual self-harm occurs in up to 20% of mothers in LMICs (17).

A study from rural Ethiopia has shown that CMD is a strong predictor of maternal functional impairment and significantly associated with indicators of socioeconomic status, stressful life events, maternal ill-health and lack of help from her husband in perinatal period (18), and has been associated with increased infant diarrhea, impaired child development (19), delaying initiation of breast-feeding more than eight hours (12) and increased child mortality (20). A Population-based study on outcome of major depression in Ethiopia has shown that the observed mortality in the group with major depression was more than 3.5 times higher than those with no depression (21).

Poverty reduction and its ultimate eradication in all its dimensions (income and non-income) have been and still are the overriding development agenda of the Government of Ethiopia (22). Despite of this, Ethiopia is one of the World's poorest countries by any standard (23), poverty in Ethiopia is more pronounced in the rural areas (24) and this is also evidenced in 2011 Ethiopia Demographic and Health Survey (22).

Therefore, this study aimed to answer the following questions: Does preexisting maternal CMD result in the slide of individuals into poverty; does poverty predispose women to maternal CMD; and what are the magnitude of incidences of poverty and maternal CMD?

1.3 Rationale and Significance of the Study

Similar to other low-income countries, mental health in Ethiopia is largely neglected, as a result there is no provision for women's mental health care or policy in Ethiopia. Additionally, there have been few studies concerning mental health of women in Ethiopia (2).

Cross-sectional studies show associations between poverty and maternal CMD in LAMICs; however, it is difficult to draw clear conclusions regarding the direction of the poverty-CMD relationship. Thus, longitudinal study is required to provide further clarity on the direction of causality in the relationship between CMD and poverty (7).

In order to guide development of appropriate interventions, it is critical to understand the extent to which poverty is a risk factor for onset or maintenance of maternal CMD or poverty is a consequence of maternal CMD. Evidence is accumulating to guide intervention, focused on integrating mental health care into routine maternal and child health care through a task sharing approach. A great deal of attention is now being paid to maternal health in LMICs. By seizing this opportunity to also attend to maternal mental health care, important public health gains can be made for both the mother and her children (1 4).

Therefore, interventions are required that address both the social causes of mental illness and the disabilities and economic deprivation that are a consequence of mental illness and is found that mental health interventions were associated with improved economic outcomes as a result improvements in economic status thus go hand in hand with improvements in clinical symptoms, creating a virtuous cycle of increasing returns (25).

This study, therefore, aimed to enhance the field's knowledge of the association between poverty and maternal CMD and will increase our understanding of the nature of this relationship in rural setting of Ethiopia and aids in planning appropriate interventions to mitigate the problem.

2 . LITERATURE REVIEW

2.1 Mental health and mental ill-health in LMICs

The long-term neglect of mental health as a public health priority is likely to have a significant impact on the health and well-being of both those at risk for poor mental health, as well as those living with mental illness in sub-Saharan Africa (SSA) region; however it is a crucial public health and development issue in this region, where little progress has been made towards achieving the MDGs (2 6). Mental, neurological, and substance use disorders are risk factors for, or consequences of, many other health problems, and are too often associated with poverty, marginaliz ation and social disadvantage (2 7).

According the mental health GAP action (mhGAP-IG) programme Intervention Guide line, depression is one of among these prioritiz ed conditions because it represents a large burden in terms of mortality, morbidity or disability, have high economic costs, and are associated with violations of human rights (2 7). The presence of mental health problems results in an enormous financial burden on individuals, their families and society as a whole, in addition to the emotional toll they carry and it affects the ability of the ill person to secure employment (28).

W HO estimates that the majority of LMICs devote less than 1 % of their health budget to mental healthcare, leading to a treatment gap of more than 7 5 % in these countries.; however, mental illness costs in these settings estimated that direct (US$ 2 8 7 billion) and Indirect (US$ 5 8 3 billion) and costs are expected to more than double by 2 0 3 0 (2 7 , 2 9).

In Ethiopia mental health has been one of the most disadvantaged health programs, both in terms of facilities and trained manpower, however, during the last decade; encouraging efforts have been taken to expand services throughout the country. Recogniz ing the need to scale up mental health services, the Ethiopian Government has shown political commitment to the successful implementation of the mhGAP supported by the Foundation d'Harcourt and the European Commission nurses (3 0)and Currently, in collaboration with the W HO mhGAP, Program for Improving Mental Health Care, Federal Ministry of Health (FMOH) is in the process of implementation significant scale-up of mental health services.

FMOH's the National Mental Health Strategy (2012/13 – 2015/16) was developed on the basis of accessible, affordable and acceptable mental health care for all Ethiopians (5). Regarding human resource there are 36 psychiatrist and more than 400 psychiatry nurses (30).

2.2 Maternal Common Mental Disorders (CMD) in LMICs

Mental health problems in pregnant women and mothers are predominantly socially determined. The risk factors in developing and developed countries are similar but the prevalence of such factors is higher in the former (31); it is two to three times more prevalent in resource constrained settings than in HICs (8). Epidemiological evidence show that CMD affects substantial number of mothers in poor countries; in the context of chronic social adversity it is especially determinantal to child development (8).

Risk factors for maternal mental health problems, include poverty and chronic social adversity, such as limited education and opportunities for income generation, and crowded living conditions (15, 32-37), gender-based violence (15, 38-40); lack of emotional and practical support or criticism from her own mother or mother in law, or peer group (32, 33, 40), gender discrimination and devaluing of women; (41, 42) and lack of empathy from partners and gendered stereotypes about the division of household work and infant care(33, 36, 43, 44).

Mental disorders are increasingly prevalent in SSA countries, due to the consequence of persistent poverty-driven conditions such as communicable and non-communicable diseases (45, 46). Studies from multilevel cross-national in LMIC and Colombia showed that being female is reported to be a risk factor for CMD (28, 47, 48) and specifically, WHO World Mental Health Surveys and other studies have shown that depressive disorders are significantly more common among women than men (13, 15).

Poor households typically face a range of risks, both economic, which in Ethiopia are often environmentally driven, and social. Both economic risks and social risks are influenced by gender dynamics; women typically have lower levels of education; less access, ownership and control of productive assets; less access to credit; and different social networks than men, leading

to lower economic productivity and income generation and weaker bargaining positions in the household (49).

In Ethiopia, maternal CMDs have been associated with increased infant diarrhea, impaired child development (19), delaying initiation of breast-feeding more than eight hours (12), and increased child mortality (20). Although mental illnesses, including CMD are common in Ethiopia, they are associated with a high burden due to disability and mortality, but largely unrecognized barriers to achieving the MDGs; statistics show that mental illnesses are more often explained away as due to psychosocial problems, e.g. marital problems or poverty in Ethiopia and other LMICs, and underscore the need for public health programs targeting mental illnesses (5).

2.3 Poverty in developing countries

Poverty is pronounced deprivation in well-being; lack of income and assets to attain basic necessities, lack of access to education and other basic services, and vulnerability to adverse shock are the main causes of poverty (5 0). Poor households in developing countries are particularly vulnerable and problems of ill-health including depression can be viewed as inherently part of the experience of poverty (5 1).

In most developing countries, poverty is highly correlated with place of residence; rural households tend to concentrate among the poor wealth groups compared to urban households and it is concentrated in LMICs (52). In absolute terms, 27% of people in developing regions live on less than $ 1 Purchasing Power Parity (PPP per day), rising to 5 3 % of people in the Least Developed Countries (53). A systematic literature review indicates that socio-economic status (SES) is a key factor in determining the quality of life of women, with resulting effects on the lives of children and families; Inequities in wealth and quality of life for women are long standing and exist both locally and globally (5 4).

In Ethiopia, there have been different sources of information on poverty, including welfare Monitoring Surveillance system, House hold Income Consumption Expenditure Surveillance system and Wealth index (50).

Addressing poverty has been an important component of the MDGs as declared by the heads of states at the Millennium Summit in September 2000 that set out goals and targets to be met by the year 2015 (55). In recognition of these goals and targets of MDGs, Poverty reduction and its ultimate eradication in all its dimensions (income and non-income) have been and still are the overriding development agenda of the Government of Ethiopia (22), however, poverty seems to persist and is more pronounced in large sections of the rural Ethiopian society with little hope for a substantial improvement of the living conditions of the rural poor in the near future (56).

Despite of this development agenda, Ethiopia is one of the W orld's poorest countries by any standard (57).According to a human development report of the United Nations Development Programme (UNDP 2013), Ethiopia's Human Development Index value for 2012 is 0.396— in the low human development category— positioning the country at 173 out of 187 countries and territories. This is below the average of 0.466 for countries in the low human development group and below the average of 0.475 for countries in Sub-Saharan Africa; while by the Multidimensional Poverty Index (MPI) the country 87.3 % of the population lived in the MPI 'head count', an additional 6.8 % were vulnerable to multiple deprivations in education, health and other living conditions, also 71.1 % are in severe poverty and 39 % below income poverty line (PPP US$ 1.25 per day) (58).

In general, contribution to overall poverty of deprivations is 27.6 %, 25.9 5 and 46.5 % in health, education and living standards, respectively (58). In line with this, in 2011 Ethiopian Demography and Health Surveillance (EDHS) report on rural Ethiopia's households, 58% and 91% were not accessible to improved drinking water and sanitation - household toilet facilities, respectively and 23.9% were in the lowest wealth quintile compared to urban residence, 2.3% (22).

The severity of poverty in the country is clearly reflected in terms of a very short life expectancy at birth, high levels of maternal and infant mortality rates, a poor basic health service coverage, a high level of adult illiteracy and unacceptably low levels of access to potable water and sanitation facilities, among others (22 , 23 , 59).

2.4 Determinants of poverty

SSA is afflicted by many forms of poverty, including income or consumption poverty, multidimensional poverty in terms of education, health and living standards (58, 60), forms of deprivation in the economic, human, political, socio-cultural and protective spheres (61) and helplessness, dependence and lack of opportunities, self-confidence and self-respect on the part of the poor (60) and as a result in this region, the determinants of poverty are numerous.

Several studies have shown that mental illnesses including CMD (7, 62), it hinders the attainment of socioeconomic status that might otherwise be expected (63), Poor mental health and depressive disorders specifically negatively impact the quality of life, reduce productivity in the work place, and interfere with social and family roles (64). Disproportionally exposed to higher rates of poverty (65, 66), gender inequality (67), being young families, for example, when asset ownership is lower and dependency ratios are higher (60) and the probability of a household being poor (marginal effect at mean values of -0.28 %) tends to diminish as age of the household head increases using per capita household calorie consumption (56), family and social support systems often disintegrate as stigma and discrimination (68),the common combination of poor mental health and chronic physical conditions has been shown to be particularly disabling (69), a fact that contributes to the strong association and ferocious cycle between poor mental health and poverty (70, 71).

2.5 Common Mental Disorder (CMD) and Poverty

The poverty causing mental disorders and mental disorders causing poverty pathways; the mechanisms by which the cycle of poverty and CMD is maintained are complex and multi-dimensional (7) and evidence suggests that they move in both directions for most mental, neurological, and substance misuse disorders (7, 25). Mental disorders have been identified as one of the leading causes of health disability worldwide, including in low income countries, and are among the most costly health conditions (71, 72).

A study from developed country (Massachusetts) has shown that downward economic mobility among psychiatric patients (moving to more or less favorable community and employment condition), all of these were no statistically significant or negligible downward drift (73), but the

poorer one's socioeconomic conditions are, the higher one's risk is for mental disability and psychiatric hospitalization regardless of the particular indicators of SES or type of mental illness examined.

The epidemiological literature of the last 19 years indicates that the social and economic conditions of poverty are linked with CMD in LMIC (7); however, the cycle increases the risk of mental illness among people who live in poverty and increases the likelihood that those living with mental illness will drift into or remain in poverty or which can in turn worsen the economic circumstances of the person and their families (7, 13, 25, 28).

In SSA and other LAMIC; narrative studies, including systematic review from these settings have shown that poverty and mental illness have been associated (26), and social and economic conditions of poverty are linked with CMD (7, 27).

Several studies, including systematic literature review from LMIC have shown that significant associations between poor mental health and lower labor force participation (especially for women) and more frequent visits to health centers (4), reverse causality (common mental disorders being a risk factor for Poverty) can be a consideration, are known to produce disability and increased health care costs.

The mental illness causing poverty pathway is due to increased health expenditure, reduced productivity, lost employment/ lose their existing job or denied work opportunities, social support systems often disintegrate or reduced social support as stigma and discrimination associated with these conditions (68, 71) and the combined realities that 75% of people with mental disorders remain untreated (74), and that mental disorders lead to high levels of social and economic disability, mean that there is an ongoing and enormous loss of human potential for social and economic development.

The presence of severe depression or anxiety disorders was associated with a significant reduction in earnings in the previous 12 months among both employed and unemployed South African adults ($p = 0.004$) (75).

Studies from India have shown that the effect is through economic deprivation on occurrence and chronicity of depression (76); women with lack of tap water in the house were two times more likely to have incidence of CMD in 1 2 -month follow up than those who have it (OR: 2 .0 9 , 9 5 % CI: 1 .0 – 4 .2) (7 7); hunger in the last 3 months (OR: 3 .3 7 , CI: 1 .3 – 8 .8) and financial stress (with those expressing difficulty making ends meet) (OR: 2.39 CI: 1.2 – 4.9) among women in India were associated with 12 -month incidence of CMD (77). A cohort study in Pakistan has also shown that women in the low SES category are three times more likely to have postnatal depression at 1 2 -month follow-up than those in a higher SES category ($p < 0 .0 5$) and has also found evidence that SES may be temporally linked to CMD (7 8).

In contrast, poor mental health may be not the "cause", but the result from poor physical health, specifically when individuals spend a substantial fraction of their life course in a disabled health status (66) and among elderly Nigerians where SES, housing conditions on the basis of "hard" versus "earth" floor was inversely associated with life time depression (with those living with earth floors at decreased risk) (79) and in a study examining community-based data in five countries revealed that poverty is not a strong determinant of poor mental health and mental health implies that poor mental health is not a ''disease of affluence'', neither is it a disease of poverty (4).

Study from Goa, India, incidence rate of antenatal depression has shown women (8)% developed depression in the postnatal period (7 6) and results from the Child Development Survey (CDS) Study in Ghana and Co ˆte d'Ivoire revealed that pregnant women with co-morbidity of depression and anxiety reported a high degree of disability regarding everyday activity limitations and participation restrictions (8 0) and mental health interventions were associated with improved economic outcomes, although the difference was not statistically significant in every study (25).

Study from Epidemiologic Catchment Area program of Eastern Baltimore, in bivariate analysis, the effect of depressive syndrome doubled the odds of financial dependency at follow up, but the odds ratio was not significant (63).

During the last decade, there has been continuing research concluding that mental disorders causing poverty (social selection or social drift) may be an important dynamic in explaining the negative SES– mental illness correlation (73). Researchers proposed the 'Drift hypothesis' that stated that the disorder results in deterioration in functioning to such an extent that the individual drifts down to a lower SES; this hypothesis is most commonly described for patients with schizophrenia; there is little evidence of this downward drift in people with other psychiatric disorders (28).

Studies from rural Ethiopia have shown that 15 or more disability days within thirty days were reported by 24 (44.4%) of those with persistent depression (21), CMD is a strong predictor for functional impairment in perinatal women (18) and among currently married women, having a seasonal job (OR = 2.94) and being relatively better off in terms of poverty (OR = 0.48) were independently associated with depression (81).

In the absence of evidence from cohort studies that explored the impact of CMD on poverty status does not imply that there is evidence of the absence of this causal pathway (7). Longitudinal epidemiological studies are required to provide further clarity on the direction of causality in the relationship between CMD and poverty (7). Therefore, this retrospective cohort study is required to provide further clarity on the direction of causality in the relationship between CMD and poverty.

2.6 Conceptual framework of relationship between poverty and maternal CMD

The relationship between poverty and maternal CMD has been suggested that it is best perceived as a vicious cycle (26). In this conceptual framework, people living in poverty are at increased risk of developing mental health problems due to factors such as increased levels of stress/CMD, exclusion, and reduced access to social capital or support, physical-ill health factors, exposure to violence and higher exposure to life events (62, 82).

On the other hand, those with mental illness are more likely to slide into poverty due to exclusion from social and economic opportunities (62), co-morbidity with physical-ill health (42). (Figure 1)

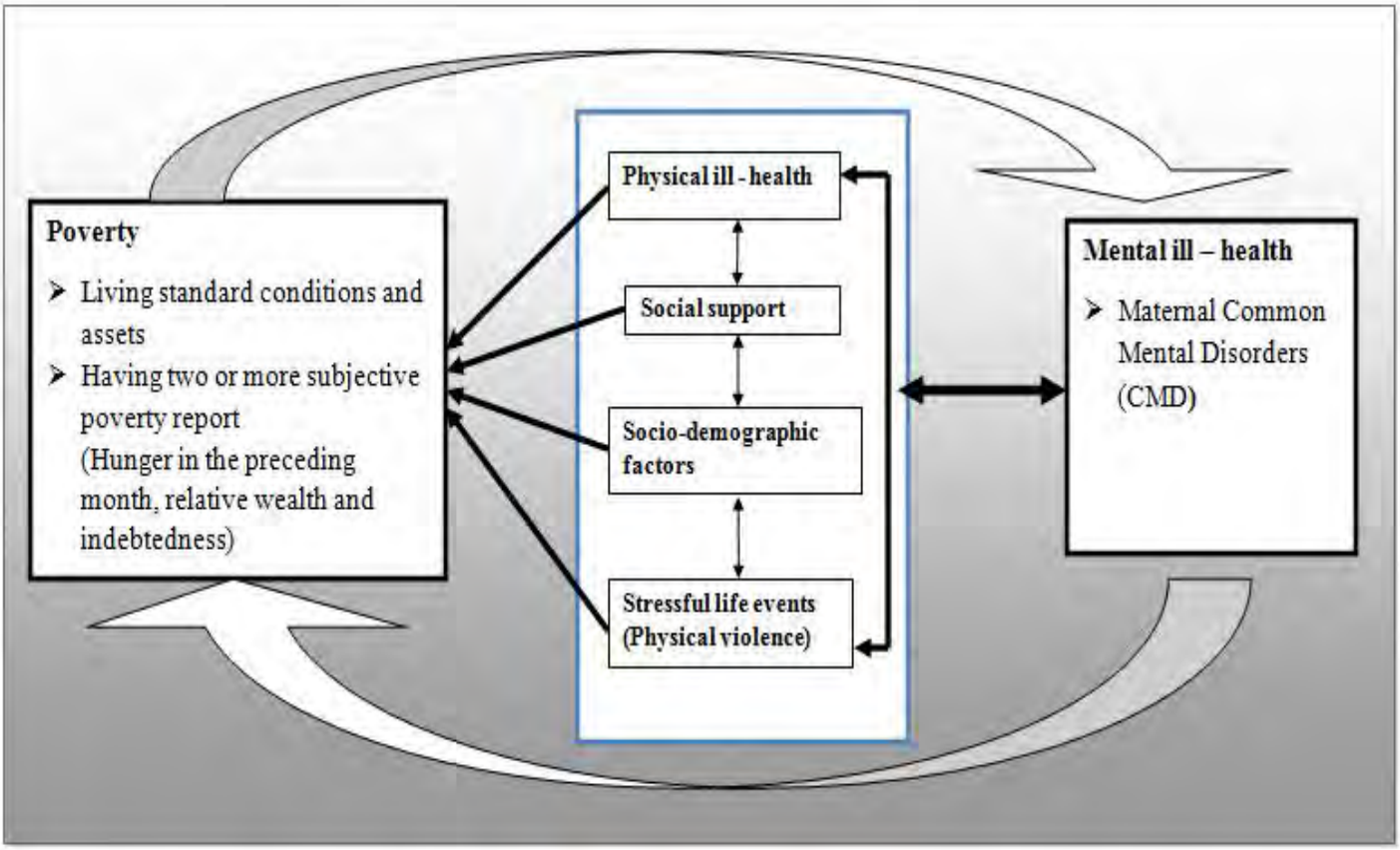

Figure 1 : A modified conceptual model of the vicious cycle of poverty and mental ill-health

Source: Crick Lund and colleagues: Poverty and mental disorders: breaking the cycle in low-income and middle-income countries; PRIME Policy Brief 1 July 2012 (25)

3 . OBJECTIVES

3.1 General Objective

To investigate incidence and association between poverty and maternal common mental disorders in a population-based cohort of pregnant women in the C-MaMiE study, Butajira, Ethiopia.

3.2 Specific Objectives

To assess the incidence of maternal common mental disorders

To assess the incidence of poverty

To investigate the association between maternal common mental disorders and poverty

4 . METHODS

4.1 Study area and data source

The study was conducted in the C-MaMiE project in and around Butajira. This population-based prospective cohort of pregnant women was established in 2005/2006 (12) with the aim of estimating the effects of common mental disorders (CMDs) in the mother on child growth, development and mortality. Health service user fees have been covered for the cohort group (both mothers and children) by the project. This project was formulated within the framework of the Demographic Surveillance Site (DSS) which forms part of the Butajira Rural Health Programme (BRHP) established in 1 9 8 6 in Butajira.

The study setting was situated in a predominantly rural area and one of the most densely populated parts of Ethiopia, located in the Southern Nations Nationalities and Peoples' Regional State (SNNPR) in Ethiopia that includes one semi-urban dwellers' association and nine rural peasant associations (83 , 84). The area is located 130 km south of the capital city Addis Abab a (Figure1). BRHP was established in four rural woredas and one town with a total population of 430, 949 out of this 217, 300 were females (85), and Butajira DSS population in 2010 was around 7 0 , 0 0 0 . Farming is the mainstay of livelihood. In addition to common crops, Enset (a false banana tree), is source of staple diet. W heat, teff, red pepper and khat are also grown as cash crops. In the Town, most people are engaged in commercial activities, including shops, food and drink establishment, workshops, flour mills and transport sector (though inadequate) predominate.

Figure 2 : Map of Africa (left), Ethiopia (middle) and the study site Meskan, Mareko and Silti District, Gurage Z one (right)

4.2 Study design

A retrospective cohort study design with CMD (exposed) and non-CMD (unexposed) groups for CMD causing poverty and on the other hand, poor (exposed) and not poor (unexposed) for poverty causing maternal CMD was conducted to investigate the temporal relationship between poverty and maternal CMD.

4.3 Source and Study population

The source population was all pregnant women (aged 15–49 years) who were living in Butajira Rural Health Program. Study population was all women who were recruited into the C-MaMiE project in pregnancy.

4.4 Inclusion and Exclusion criteria

4.4.1 Inclusion criteria

Women between the ages of 15 and 49 years, living in the demographic surveillance site area and in the third trimester of pregnancy during the study recruitment period (March 2005 to July 2006). Women who had information on all key variables of interest were included.

4.4.2 Exclusion criteria

All women who were defined as having 'poverty' in pregnancy, this for maternal CMD causing poverty and the other way round (poverty causing maternal CMD), all women who had CMD in pregnancy and who had dead baby (the reason was that if the CMD measurement was close in time to the death then we should consider it to be a normal grief reaction and not CMD) were also excluded from the analysis.

4.5 Sample size determination and power calculation

Maternal CMD causing poverty

The sample size was calculated based on the prevalence estimate for primary outcome (poverty) derived from C-MaMiE study (86) with a ratio of exposed to unexposed of 1:5. As per literature indicate that there was no evidence from cohort studies that explored the impact of CMD on

poverty status (7), thus, the study anticipated with expected frequency of poverty in the exposed group was 74% and in unexposed group was derived from C-MaMiE study (57 %) (86).

A total sample of 462 was adequate with exposed group of 77 and unexposed group of 385; however, the study used all the recruited women in the C-MaMiE study; 659 were included in the study. The power was tested using Open Epi version 2.3 by assuming that the study with alpha of 0.05 and beta of 0.20 for comparison of poverty indicators with CMD allowed for estimating OR higher than 2.2. Manually, this sample size was calculated using two population proportions formula:

$$n = \frac{(z\alpha/_2 + z(1-\beta)^2}{r(p1-p2)^2}(pq)(r+1) = \mathbf{77}$$ and $n_2 = rn_1 = 5 * 77 = \mathbf{385}$

n1 + n2 = **462**

W here, n1 = number of exposed (women with CMD)

n2 = number of unexposed (women without CMD)

r = ratio of unexposed to exposed = 5

p1 = proportion of exposed with the outcome (poverty) = 0.74, and $q_1 = 1 - p_1 = 0.26$

p2 = proportion of unexposed with the outcome (poverty) = 0.57, and $q_2 = 1 - p_2 = 0.43$

$$\bar{p} = \frac{p1 + rp2}{r+1} = 0.74 + 5(0.57)/5 + 1 = 0.598$$ $\bar{q} = 1 - \bar{p} = 1 - 0.598 = 0.402$

Poverty causing maternal CMD

In a similar way, the sample size was calculated based on the prevalence estimate for primary outcome (maternal CMD) derived from Tanzania, Dare Salaam (87) with a ratio of exposed (Poor) to unexposed (Not poor) of 1:1. Expected frequency of CMD in the exposed group was 45.9% and in unexposed group was 36.6% . A total sample of 624 was adequate with exposed of 312 and unexposed of 312; however, the study used all the recruited women in the C-MaMiE study; 756 women were included in the study. The power has been tested using Open Epi

version 2.3 by assuming that the study with alpha of 0.05 and beta of 0.20 for comparison of maternal CMD with poverty allowed for estimating OR higher than 1.6.

Manually, this sample size was also calculated using two population proportions formula:

$n = \frac{(z\alpha/_2 + z(1-\beta))^2}{r(p1-p2)^2}(pq)(r+1) =$ **236** and $n_2 = rn_1 =$ **236**

n1 + n2 = **472**

W here, n1 = number of exposed (received the free health care provided)

n2 = number of unexposed (comparison group for the intervention)

r = ratio of unexposed to exposed =1

p1 = proportion of exposed with the outcome = 0.46, and q1 = 1 -p1 = 0.54

p2 = proportion of unexposed with the outcome = 0.37 , and q2 =1 -p2 = 0.63

$\bar{p} = \frac{p1 + rp2}{r+1}$ = 0.46 +1(0.37)/1+1 = 0.42 $\bar{q} = 1 - \bar{p}$ = 1 -0.42 = 0.58

4.6 Data collection procedures (Instrument, personnel, Data Quality Control)

The study used secondary data obtained from C-MaMiE study; were measured in pregnancy and at 2, 12, 30, 36, 42, 54, 60 and 78 months postnatal and collected by trained data collectors under the control of the C-MaMiE project. The project data collectors were local women with completed high-school education who worked exclusively on the C-MaMiE project and had been trained for a minimum of one week in questionnaire administration.

Study participants were interviewed during their third trimester of pregnancy (March, 2005 to July, 2006) and at 2, 12, 30, 36, 42, 54, 60 and 78 months postnatal. CMD was measured using standardized data collection instrument tools (WHO's Self-Reporting Questionnaire-20 items) and validated in Ethiopia (88). Self-report of various poverty indicators (hunger in the preceding month, indebtedness, relative wealth to others and emergency resources to survive for one month in the event of an emergency) have also been measured at the same time points.

4.7 Operational definitions

Maternal common mental disorder: - a mental illness, includes depression and anxiety which occurs in perinatal period and beyond.

Self Reporting Questionnaire-20 items (SRQ-20):- is a 20-item scale asks about depressive, anxiety and somatic symptoms present in the preceding month.

CMD Case: - defined based on the cutoff score of the Self Reporting Questionnaire (SRQ-20) items; participants who scored 6 or more were taken as case (88).

Poverty: - constructed from eighteen items of living standard conditions and assets; scale equal or greater to 0.30 Loevinger H coefficients using Mokken scaling in pregnancy time point and/or if a person has two or more report of the following three conditions: experience of hunger in the last month, debt cannot pay and level of household wealth relative to others at follow up time points.

4.8 Variables

4.8.1 Dependent variable

Two data-sets were prepared to analyze the relationship between CMD and poverty.

CMD causing poverty pathway: the dependent variable was self-report of various poverty indicators (having two or more report on relative wealth, indebtedness and hungry in the preceding month) have been measured in pregnancy and at 2, 12, 30, 36, 42, 54, 60 and 78 months postnatal. All of these measures have been used previously in the C-MaMiE study or Butajira DSS (86, 89).

Poverty causing CMD pathway: the dependent variable was maternal CMD that has been measured using the Self-Reporting Questionnaire (SRQ – 20) at the same time points.

4.8.2 Independent variables

In the same fashion with the above; the major independent variable for CMD causing poverty was Common Mental Disorders (CMD) measured using SRQ – 20. This 20-item scale asks about depressive, anxiety and somatic symptoms present in the preceding month (90) and it generates a

continuously distributed scale score indicating level of overall psychological morbidity. The SRQ – 20 was extensively pre -validated for use in a mixed sample of pregnant and postnatal women in the Butajira population (8 8).

In the other way round; regarding to poverty causing CMD; the major independent variable was poverty (poor in living standard conditions) which was computed using Mokken scaling method.

4.8.3 Other covariates

Potential confounding variables were grouped into domains as shown below:

(a) Maternal age and education
(b) Residence (Urban V. Rural)
(c) Social support: frequency of contact with family and friends (dichotomized as monthly or less v. at least weekly), received not enough help from family and with housework.
(d) Maternal ill health: episodes of diarrhoea, malaria and overall maternal health status in antenatal time point.
(e) Husband characteristics: employment and educational status
(f) Antenatal violence
(g) Marital status

4.9 Measures

Poverty

Poverty was constructed using eighteen item response questions related to living standard conditions and assets; was indicated with the following variables: living standard conditions (owning of a bed, business and radio, availability of a toilet facility and sanitary means for disposal of rubbish, having a window within the home, type of roof and water supply) and assets (level of household wealth relative to others, experience of hunger in the preceding month, indebtedness, emergency resources, owning of large and small animals, owning of crop, valuable goods, land and house) at recruitment. For the follow up assessment of poverty; study participants were rated as having two or more report on the 3 -point self-report of poverty indicators (relative wealth to others, experience of hunger in the preceding month and indebtedness) (3 2).

These items were successively refined and evaluated to form a one-dimensional homogenous scale using the standard procedure of Mokken (91).

Poverty scale item-pair Loevinger coefficients were generated using the Mokken Scaling Procedure with loevh and msp commands in stata 12, and methods check the assumptions of Mokken scale analysis (the lower bound individual item and item pair coefficients should be ≥ 0.3 with P-value < 0.05), based on this item-scalability coefficient, the selection program started with the item-pair that had the highest significantly positive (item-pair coefficient) were sequentially added one by one to the scale, retained if the Loevinger H item-scale coefficient for the individual item was ≥ 0.30. When an item Loevinger H coefficient is < 0.3 was excluded from the scale, the procedure was performed repeatedly until the item pool was exhausted or if the loevinger H coefficient of the set of selected items drops below a user-specified lower bound for each choice from the remaining items.

Study participants with higher scores were considered to be poor in living standard conditions and assets vice versa. The items that satisfied the assumptions of the Mokken analysis can be added up and individual scores are then computed as the rank of the highest endorsed item in this hierarchy, i.e. it is a simple total score (sum of positive/negative responses).
This total score is used as an estimate of the level of the latent construct, in our case poverty in each study participant. Finally, poverty was constructed using five living standard item responses (owning radio, bed and business, and availability of toilet facility, means of rubbish disposal and window within the home); all these retained items in the model their values/scores were summed up and once the Lovenger H coefficient of the entire sample scale was computed, the study participants' quintiles (from lowest to highest) were obtained by assigning the items score to each women, ranking each women in the sample by her score, and then dividing the ranking into five equal categories, each comprising 20 percent of the sample (22). Poverty scale was confirmed using Mokken analysis (Loevnger H coefficient 0.54).

Social support

Similarly, social support scale was constructed from the following variables: received insufficient help from family and with housework and insufficient help with children. It was confirmed using Mokken analysis (Loevinger H coeff 0 .6 2).

Mokken scaling

Responses to poverty and social support (9 2) questions were analyzed using Mokken analysis. The Mokken model is seeing increasing use in contemporary clinical research and public health (93).This approach has been used widely in psychology, education and social science research, and more recently has been applied within psychiatric research (94).This scaling method has also been used to construct living standard scale to evaluate socio-economic status and marital discord scale of the sample in C-MaMiE study in Butajira (86).

Mokken analysis assumes the existence of an underlying latent (unobserved) attribute and has probabilistic nature. It is a generalization of Guttmann scaling. The crucial aspect of the Mokken scale analysis is its ability to establish hierarchies of items ordered by 'difficulty' (9 1). In Mokken scales, the relative ordering of items is assumed to reflect ordering along an underlying latent trait (8 6).Mokken scales require three basic assumptions: (1) unidimensionality, (2) local independence, and (3) monotonicity. Scale homogeneity is based on Loevinger's index of homogeneity H (95).

As a rule of thumb Loevinger's coefficient H< 0.30 indicates poor scalability properties, for 0.30< H< 0.40 the scale is weak; for 0.40< H< 0.50 th e scale is medium, and for H> 0.50 the scale is strong. The presence of a Mokken scale justifies summing item scores (9 6). Following standard procedure, item-pair Loevinger coefficients for poverty and social support were evaluated. The conditions of monotone homogeneity and double monotonicity were assessed and items leading to violations were removed (minimal violation = 0 .0 3). The Loevinger H for each final scale was evaluated (Table 1).

Maternal Common Mental Disorder

All recruited women in the C-MaMiE study were assessed for their common mental disorder symptoms. Any women found anxious and depressed on Self-Report Questionnaire-20 (SRQ-20) scale with high levels of CMD symptoms; who scored 6 or more were considered to have CMD during pregnancy to 78 months after childbirth. The timings of assessment were in pregnancy and at 2, 12, 30, 36, 42, 54, 60 and 78 months postnatal (8).

Women found to be anxious and depressed at least once out of nine assessment times were considered for the computation of overall exposure as well as incidence of CMD (outcome).

4.10 Data processing and analysis procedures

Analysis was conducted using STATA/SE version 12 for Windows. This was approached in two different ways; two data-sets for both maternal CMD causing poverty and poverty causing CMD pathways were prepared from the original sample comprised of 1065 women. The study participants were followed up for a total of 6.5 years.

Maternal CMD causing poverty: a total sample of 659 poverty free women, (80 exposed to CMD and 579 unexposed to CMD) were included in the study after excluding all women with poverty, [the highest poverty quintile, 20% (362 study participants)] at base line and those who lost to follow up (44).

Poverty causing CMD: a total sample of 756 CMD free women, [493 exposed (poor in living standard conditions) and 263 unexposed] were included in the study following exclusion of women with CMD (128) at base line and this analysis was restricted to women who were their baby alive because if the CMD measurement is close in time to the death then it should be considered as a normal grief reaction and not CMD (Figure 3).

Summary of data extraction

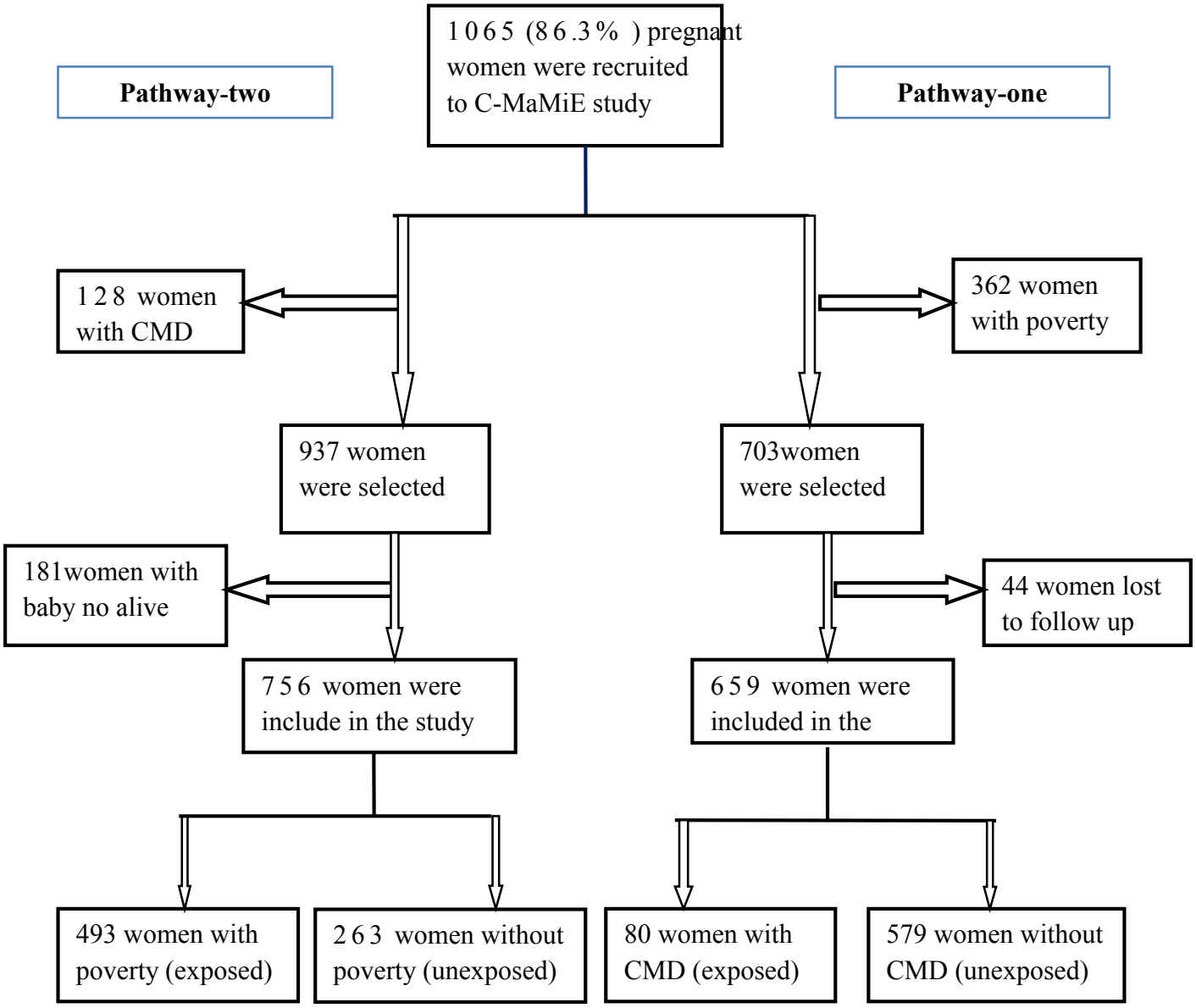

Figure 3 Flow diagram of summary of data extraction for poverty causing CMD and CMD causing poverty of the Child outcomes-Maternal Mental Disorder in Ethiopia (C-MaMiE) study

CMD: common mental disorder
Pathway-one: CMD causing poverty
Pathway-two: poverty causing CMD

The percentage distribution of different characteristics of women, husband and maternal physical-ill health was generated for exposed and unexposed cohorts of CMD causing poverty as well as poverty causing CMD and their associations were observed using chi-square test (Pearson Chi-Square or Fisher's Exact Test) and a T-test to compare categorical and continuous variables between the two cohorts, respectively.

Further analysis included; Poisson regression was employed to calculate the incidence rate ratio of maternal CMD and poverty. Incidence rate/person year observation, rate ratio and mean follow up time with 95% confidence interval were estimated.

Associations between outcome of interest (poverty for CMD causing poverty and CMD for poverty causing CMD pathways); socio-demographic factors of study participants and their husbands, maternal physical – ill health and social support were examined using odd ratios. These ratios and their 95 percent confidence intervals were computed using logistic regression. All variables having a p-value less or equal to 0.20 at biviariate level were considered eligible for multivariable analysis. Adjusted odds ratios with 95 percent confidence intervals were estimated.

4.11 Data quality management

Data were extensively cleaned and edited prior to analysis using simple frequencies and cross tabulation. Check list was developed to select important variables which were relevant to this study. All the relevant variables were inspected; recoding, merging and preparing of data-sets were done properly and checked for missing values.

4.12 Ethical Consideration

Research Ethics Committee of School of Public Health, Addis Ababa University was reviewed the protocol and ethical clearance was obtained after approval. Official letter of co-operation to respected organization was obtained from School of Public Health, Addis Ababa University.

Data were obtained from C-MaMiE project in BRHP with permission. The present study assured that women were provided adequate explanation on the aim of the project and were given informed consent in order to participate.

The data were collected in the participants' house and it was tried to keep the privacy of the women. All women were reimbursed for health care costs for themselves and the project child for the duration of the project. Any women suffering from severe mental disturbance were given money for transport and referred for assessment to the local psychiatric unit in Butajira town, staffed by two psychiatric nurses and a general practitioner.

4.13 Dissemination of results

The final report will be presented as partial fulfillment of the degree of Masters of Public Health to Department of Preventive Medicine, School of Public Health, Addis Ababa University, and a copy of it will be offered to C-MaMiE project, psychiatry department of Addis Ababa University. It will also be disseminated through workshops, Presentation of findings in other forums and Publications in scientific journals.

5 . RESULTS

5 .1 Poverty and social support composite were constructed and confirmed using the Mokken Scaling Procedure (Table 1).

Out of eighteen items related to living standard conditions and assets; only five items (means of rubbish disposal with Loevinger H coefficients of 0.49, availability of window with 0.50 , Owning radio, bed and business with 0 .4 9 , 0 .7 9 and 0 .5 9 respectively) that satisfied the assumptions of the Mokken analysis were retained in the model.

All these retained items were used to construct poverty (with 0 .5 4 Loevinger H coefficient of the entire sample scale) and this scale was strong. In a similar way, social support scale was constructed using three items (not enough help from family, not enough help at home and not enough help with children with Loevinger H coefficients of 0 .3 3 , 0 .6 9 and 0 .7 0 respectively). The global Loevinger H coefficient (0.62) of the socia l support scale was also strong.

Table 1 : individual item (Hi) and overall scale (H) coefficients for binary recoded poverty indicator and social support items scoring method

Poverty	
Items	**Item scalability (Loevinger H coeff)**
Means of rubbish disposal	0 .4 9
Availability of window	0 .5 0
Owning radio	0 .4 9
Owning bed	0 .79
Owning business	0 .5 9
Scale Loevinger H coefficient	**0.54**
Social support	
Items	**Item scalability (Loevinger H coeff)**
Not enough help from family	0 .3 3
Not enough help at home	0.69
Not enough help with children	0 .7 0
Scale Loevinger H coefficient	**0.62**

The conditions of monotone homogeneity and double monotonicity were evaluated. Data were adequately assessed for model fitness and items leading to violations were removed. Numerical summary was described in Table 2 .

In measuring poverty and social support scales; means of rubbish disposal, availability of window, owning of radio, bed and business were selected to constructed poverty and not enough help from family, not enough help at home and not enough help with children were also used to composite social support scale after checking of the minimal and significant violation for Mokken analysis assumptions. These all items responses retained in both models did not violate the Mokken analysis assumptions with zero minimal and significant violations.

Table 2 : Summary per item for check of monotonicity and monotone homogeneity models of poverty and social support scalability

Poverty			
Item	(Number of active comparisons)	(Number of minimal violations)	(Number of significant violations)
Means of rubbish disposal	3	0	0
Availability of window	3	0	0
Owning radio	3	0	0
Owning bed	6	0	0
Owning business	6	0	0
Social support			
Not enough help from family	3	0	0
Not enough help at home	3	0	0
Not enough help with children	3	0	0

5.2 Sample characteristics

5.2.1 Maternal CMD causing poverty

Characteristics of the study sample at recruitment (pregnancy time-point) are shown in Table 3 . A total of 659 women (80 with CMD and 579 without CMD) were included for the study and followed for a mean of 5.45 years with 95% CI (5.02, 5.88) among CMD group and 5.55 years among non-CMD group with 95% CI of (5.39, 5.71).

Baseline socio-demographic characteristics of the study participants and their husbands

In this study, the two cohorts were not statistically different in any of the identified socio-demographic attributes except in their husbands' employment status. Twenty eight (35%) in the CMD group and 230 (39.72%) in the non -CMD group were in the age group of 15 – 24 years and 35 (43.75%) in the CMD group and 267 (46.11%) in the non -CMD group were in the age group of 25-34 years. The mean age in the CMD group was 27.62 (SD, ± 6.65) years and 26.56 (SD, ±6.27) years in non -CMD group. More than three fourth of women in both cohorts were living in a monogamous marriage with 68 (85%) in the CMD group and 473 (81.69%) in the non-CMD group. The majority of the study participants in both cohorts were from rural community with 66 (82.50%) in the CMD group and 467 (80.66%) in the non-CMD group. With regard to ethnicity composition of the sample, more than one third were Meskan with 33 (41.25%) in the CMD group and 281 (48.53%) in the non-CMD group.

Almost three fourth of the study participants had no formal education, 59 (73.75%) in the CMD group and 437 (75.47%) in the non-CMD group. More than three fourth of the study participants were housewives or farmers with 65 (81.25%) in the CMD group and 498 (86.01%) in the non-CMD group. With regard to religious composition of the sample, 57 (71.25%) in the CMD group and 437 (75.47%) in the non -CMD group were Muslim. Characteristics of husbands were also described, more than two third of women's husbands in both cohorts had completed primary school and above with 52 (65.83%) in the CMD group and 413 (71.83 %) in the non-CMD group. Employment status of husbands was indicated with 52 (72.15%) in the CMD group and 494 (85.76%) in the non-CMD group were unemployed.

Table 3 : Base line socio-demographic and socio-economic characteristics of women and their husband comparing CMD versus non-CMD using Chi-Square test in rural Ethiopia, C-MaMiE study, Butajira, 2005 (n = 659)

Variable	Status of Common Mental Disorders (CMD)		Chi2 (df) or T-test (df)	p-value
	CMD Number (%)	Non-CMD Number (%)		
Age group (years)				
15 -24	28 (35.00)	230 (39.72)	2.84	0.24
25-34	35 (43.75)	267 (46.11)	(3)	
35 -44	17 (21.25)	82 (14.16)		
Mean ± SD*	27.63 (6.65)	26.56 (6.27)	-1.41 (657)	0.92
Marital status				
Monogamous	68 (85.00)	473 (81.69)	1.42	0.45
Polygamous	11 (13.75)	102 (17.62)	(2)	
Others* *	1 (1.25)	4 (0.69)		
Place of residence				
Urban	14 (17.50)	112 (19.34)	0.15	0.69
Rural	66 (82.50)	467 (80.66)	(1)	
Ethnicity				
Meskan	33 (41.25)	281 (48.53)	5.92	0.12
Mareko	8 (10.00)	69 (11.92)	(3)	
Silti	16 (20.00)	128 (22.11)		
Other [a]	23 (28.75)	101(17.44)		
Maternal educational status				
Formal education	21 (26.25)	142 (24.53)	0.11	0.74
No formal education	59 (73.75)	437 (75.47)	(1)	
Maternal occupation status				
Self or paid employee	15 (18.75)	81 (13.99)	1.28	0.26
House wife or farming	65 (81.25)	498 (86.01)	(1)	

Table 3 (continued)

Religion				
Muslim	57 (71.25)	437 (75.47)	2.46	0.43
Orthodox Christian	19 (23.75)	97 (16.75)	(2)	
Protestant	4 (5.00)	40 (6.91)		
Catholic	-	5 (0.86)		
Husband educational status				
Non educated	27 (34.18)	162 (28.17)	1.28	0.53
Primary school	44 (55.70)	355 (61.74)	(2)	
Secondary and above	8 (10.13)	58 (10.09)		
Employment status				
Employed	22 (27.85)	82 (14.24)	9.63	0.002♦
Unemployed	57 (72.15)	494 (85.76)	(1)	

* Standard Deviation, * * single, widowed, separated, [a]sodo, Oromo, Amhara, ♦significant at $\alpha < 0.05$

Physical-ill health and social support characteristics of study participants

Study participants reported some physical-ill health and social support problems during pregnancy (Table 4).

In this study, the two cohorts were statistically different regarding to physical-ill health (overall health status and malaria) attributes. In the CMD group a higher proportion (61.25%) of women had overall health condition problem compared to those in the non-CMD group (20.21%), (X^2 = 62.83; df (1); p < 0.001). With regard to malaria disease, in the CMD group a higher proportion (25.32%) of women had malaria compared to those in the non-CMD group (14.56%), (X^2 = 6.03; df (1); p = 0.014). Less than one fifth of women in both cohorts with 12 (15.19 %) in the CMD group and 76 (13.50%) in the non-CMD group had not been provided enough support from their partner or family.

Table 4 : Physical-ill health and social support characteristics of women comparing CMD and non-CMD using Chi-Squared test in rural Ethiopia, C-MaMiE study, Butajira, 2005 (n = 659)

Variables	Status of Common Mental Disorders (CMD)		Chi2 (df)	p-value
	CMD Number (%)	Non-CMD Number (%)		
Overall health status				
Good or excellent	31 (38.75)	462 (79.79)	62.83	< 0.00♦1
Average, poor or very bad	49 (61.25)	117 (20.21)	(1)	
Malaria				
Not had malaria	59 (74.68)	493 (85.44)	6.03	0.014♦
Had malaria	20 (25.32)	84 (14.56)	(1)	
Social support				
Supported	67 (84.81)	487 (86.50)	0.17	0.68
Not supported	12 (15.19)	76 (13.50)	(1)	

♦Significant at α <0.05

Comparison of incidence of poverty between CMD and non-CMD cohorts

Poverty incidence rate and rate ratio for the sample were calculated using person-time in year and Poisson regression (Table 5). A total of 659 study participants contributed a cumulative total of 3650.25 person-years of observation (PYO) to this study; the CMD group contributed 436 PYO and the non-CMD group contributed 3214.25 PYO. In the CMD group, 32 (4.86%) of women experienced poverty in the subsequent time points, which represented a lower percentage than the 181 women (27.47%) who experienced it in the non-CMD group. Majority of the study participants 70 (10.62%) developed poverty at 12 month time point.

The poverty incidence rate ratio was 1.30 with 95% CI of (0.87, 1.91) ; person-years observation was also calculated; in the CMD group was 73.39 per 1000 PYO with 95% CI of (51.90, 103.79) and in the non-CMD group was 56.31 per 1000 PYO with 95% CI of (48.67, 65.14). However, there was no statistically difference between the CMD and non-CMD groups regarding to both

rate and rate ratio but the poverty incidence rate among the CMD group was higher in magnitude than non-CMD group with a difference of 17.06 per 1000 PYO. The overall poverty incidence rate during follow up time points was 58.4 per 1000 PYO with 95% CI (51.02, 66.74). The mean time to poverty was 3.88 years in the CMD cohort and 3.47 years in the Non-CMD cohort.

Table 5 : Comparison of incidence poverty between CMD and non-CMD groups of women in rural Ethiopia, C-MaMiE study, Butajira, between 2005 and 2012

Outcome measure	**Status of maternal CMD**		
	CMD (95% CI)	**Not CMD (95% CI)**	**Total (95% CI)**
Incidence of poverty	32	181	213
Person-years observation	436	3214.25	3650.25
Incidence rate	73.39 (51.90 -103.75)	56.31 (48.67 - 65.15)	58.35 (51.02 - 66.74)
Incidence rate ratio	1.30 (0.87 - 1.91)		

CMD: Common Mental Disorder, CI: confidence Intervals

The poverty incidence rate among the CMD and the non-CMD with 95 percent confidence intervals across various socio-demographic characteristics of study participants and their husbands, maternal physical health and social support are presented in Table 6.

The poverty incidence rates were 5.6, 6.1, and 5.6 per 1000 person-years of observation in the age group of 15-24, 25-34 and 35-44 years respectively. The level of poverty incidence rates differed across various marital status groups. Women living in monogamous and polygamous marriage had similar poverty incidence rate 55.4 and 70.4 per 1000 and the others group (separated, divorced and widowed) had highest poverty incidence rate of 125.4 per 1000 person-years of observation. There were more poverty incidence rates among women who had no formal education compared to those who had formal education with a level of 60.5 and 51.9 per 1000 person-years of observation respectively.

The level of poverty incidence rate was less among women who were house wives or farming compared to those who were self or paid employee with 55.7 and 74.5 per 1000 person-years observation respectively. There was less poverty incidence rate among women whose husbands

had completed secondary and above compared to those whose husbands had completed primary and no-educated with a level of 32.2 , 56.1 and 72.3 respectively.
There were less poverty incidence rates among women who were unemployed compared to those who were employed with a level of 55.2 and 72.41 per 1000 person-years of observation respectively.

The 78.5 poverty incidence rate per 1000 person-years of observation among women who had overall health problem was higher compared to the level of among those who had not experienced the health problem. With respect to malaria disease, the poverty incidence rate was higher among women who had malaria compared to those who had not experienced it with a level of 83.94 and 54.01 respectively. Poverty incidence rate was variable across social support. Respective poverty rates were 82.1 and 52.8 person-years among women who had been supported regarding to child care, frequency of contact with friends and family and home work compared to those who had been provided enough support. The poverty rate was higher among women with CMD compared to those without CMD with 73.39 and 56.31 respectively.

Model 1: Maternal CMD causing poverty

The associations of incidence of poverty with base line variables were examined using logistic binary regression model. Results from bivariate analysis of primary independent variable, each covariate and incidence of poverty are presented in Table 6.

Some base line variables were significantly associated with incidence of poverty and were important predicators of poverty in the bivariate analysis; the odds of poverty were 1.67 with 95% CI of (1.16, 2.39) times higher among women who had experienced overall health problem compared to those who had not experienced it. On other hand, the odds of poverty were 1.68 with 95% CI of (1.09, 2.57) times higher among women who had malaria compared to those who had not experience. With respect to social support; odds of poverty were 1.62 with 95% CI of (1.01, 2.57) times higher among women who had not been supported (poor social support) regarding to child care and help with home work by their partner/family compared to those who had been provided enough help.

The odds of incidence of poverty were about 0.39 (95% CI: 0.20, 0.78) times lower among women whose husbands had completed secondary and above school compared to those whose husbands educational level of non-educated.

Table 6 : Crude odds ratio and poverty incidence rates per 1000 person -years observation among women in C-MaMiE study, Butajira, Ethiopia, (n = 659) between 2005 and 2012

Variables	Number at risk	Number of poverty	Incidence of poverty per 1000 PYO (95% CI)	Crude OR (95% CI)
Age group (years)				
15-24	258	82	5.61 (4.52 - 6.97)	1
25-34	302	100	6.13 (5.04 - 7.45)	1.06 (0.74 - 1.52)
35-44	99	31	5.57 (3.92 - 7.92)	0.98 (0.59 - 1.61)
Marital status				
Monogamous	541	168	55.44 (47.66 - 64.49)	1
Polygamous	113	42	70.44 (52.06 - 95.32)	1.31 (0.86 - 2.00)
Others♦	5	3	125.4 4 (40.46 - 388.92)	3.33 (0.55 - 20.12)
Maternal educational status				
Formal education	163	48	51.99 (39.18 - 68.99)	1
No formal education	496	165	60.51 (51.94 - 70.48)	1.19 (0.81 - 1.76)
Maternal occupation status				
Self or paid employee	96	38	74.49 (54.19 - 102.37)	1
House wife or farming	563	175	55.73 (48.06 - 64.63)	0.69 (0.44 - 1.08)*
Husband educational status				
Non educated	189	72	72.33 (57.41 - 91.13)	1
Primary school	399	125	56.13 (47.11 - 66.89)	0.74 (0 .52 - 1.06)*
Secondary and above	66	13	32.1 8 (18.68 - 55.42)	0.39 (0.20 - 0.78)*
Husband employment status				
Employed	104	40	72.41 (53.11 - 98.71)	1
Unemployed	551	170	55.19 (47.48 6 - 4.14)	0.71 (0.46 - 1.10)*

Table 6 (continued)

Overall maternal health status				
Good or excellent	493	145	52.08 (44.26 - 61.28)	1
Average, poor or very bad	166	68	78.52 (61.91 - 99.59)	1.67 (1.16 - 2.39)*
Malaria				
Had no malaria	552	168	54.01 (46.43 - 62.83)	1
Had malaria	104	44	83.94 (62.47 - 112.79)	1.68 (1.09 - 2.57)*
Social support				
Supported	554	166	52.82 (45.36 - 61.49)	1
Not supported	88	36	82.11 (59.23 - 113.84)	1.62 (1.02 - 2.57)*
Common Mental Disorder (CMD)				
Non-CMD	579	181	56.31 (48.68 - 65.14)	1
CMD	80	32	73.39 (51.90 - 103.79)	1.47 (0.91 - 2.37)*

♦single, widowed, separated, *variables significant at $\alpha \leq 0.20$ included in the adjusted model

The simultaneous effects of significant risk factors on incidence of poverty were analyzed using multivariate logistic regression analysis, including only those variables that had a significant effect in the bivariate analysis (all variables having a P-value less or equal to 0.20 were considered eligible for multivariable analysis) were included in the adjusted model. In multivariate analysis; the adjusted effects of primary independent variable and other covariates on the incidence of poverty are presented in Table 7.

There was no significant effect of the primary exposure, maternal CMD upon incidence of poverty over time; the strength of the association was also reduced from OR: 1.47 (95% CI: 0.91 - 2.37) to OR: 1.15 (95% CI: 0.68 - 1.95) after adjusting for potential confounding variables. In the fully adjusted model, maternal occupational status was also not statistically significant associated with poverty where as women whose husbands had completed primary school which was previously non-significant at birvariate and completed secondary and above were less likely to experience poverty in the subsequent time points than those whose husbands no-educated one. The odds of incidence of poverty were 0.66 (95% CI: 0.45 - 0.96) times lower among women whose husbands educational levels of primary school compared to those whose husbands levels no-educated; similarly odds of poverty were 0.36 with 95% CI of (0.18, 0.73) times lower among

women whose husbands educational levels secondary and above compared to those whose husbands levels of no-educated. Women who had not bee n supported regarding to children care and home work from partners/family (OR: 1 .7 0 , 9 5 % CI: 1 .0 6 - 2 .7 5) were more likely to report poverty at the follow up time points than those who had been provided enough help. The association of maternal overall health problem (OR: 1.48 , 95% CI: 0.99 - 2.24) with incidence of poverty was marginal.

Table 7 : Crude and adjusted incidence of poverty along with 9 5 % confidence interval among women in rural Ethiopia, C-MaMiE study, Butajira (n = 6 5 9) between 2 0 0 5 and 2 0 1 2

Variables	Crude OR (95% CI)	Adjusted OR (95% CI)
Maternal occupational status		
Self or paid employee	1	1
House wife or farming	0.69 (0.44 - 1.08)	0.62 (0.37 - 0.99)
Husband educational status		
Non educated	1	1
Primary school	0 .7 4 (0 .5 2 - 1 .0 6)	0 .6 6 (0 .4 5 - 0 .9 6)
Secondary and above	0 .3 9 (0 .2 0 - 0 .7 8)	0 .3 6 (0 .1 8 - 0 .7 3)*
Overall maternal health status		
Good or excellent	1	1
Average, poor or very bad	1 .6 7 (1 .1 6 - 2 .3 9)	1 .4 8 (0 .9 9 - 2 .2 4)*
Malaria		
Had no malaria	1	1
Had malaria	1.68 (1.09 - 2.57)	1.52 (0.96 - 2.39)*
Social support		
Supported	1	1
Not supported	1 .6 2 (1 .0 2 - 2 .5 7)	1 .7 0 (1 .0 6 - 2 .7 5)*
Common Mental Disorder (CMD)		
Non-CMD	1	1
CMD	1 .4 7 (0 .9 1 - 2 .3 7)	1 .1 5 (0 . 6 8 - 1 .9 5)

*Adjusted for husband educational status, maternal overall health, and social support
Those variables are shown that had p-value ≤ 0 .2 0 on bivariate analysis. All other variables not shown remained insignificant.

5.2.2 Poverty causing maternal CMD

Characteristics of the study sample at recruitment (pregnancy time-point) are shown in Table 8. A total of 756 women, [493 exposed (poor in living standard conditions) and 263 unexposed (not poor in living standard conditions)] were included for the study and followed for a mean of 5.79 years with 95% CI of (5.64, 5.94) among poor group and 5.93 years among not poor group with 95% CI of (5.74, 6.11).

Baseline socio-demographic characteristics of the study participants

In this study, the two cohorts were statistically different in relation to the identified socio-demographic attributes except in age group and marital status. More than one third of women in both cohorts; with 196 (39.76%) in the poor group and 111 (42.21%) in the not poor group were in the 15–24 year age group and 229 (46.45%) in the poor group and 122 (46.39%) in the not poor in 25-34 year age group. The mean age in the poor group was 26.7 (SD, ± 6.4) years and 26.1 (SD, ± 5.8) years in the not poor group.

More than three fourth of women in both cohorts with 386 (78.30%) in the poor group and 215 (81.75%) in the not poor group were living in a monogamous marriage. In the poor group a higher proportion (98.58%) of women were from rural community compared to women in the not poor group (60.46%), (X^2 = 198.99.28; df (1); p < 0.001).

With regard to ethnicity composition of the sample, in the poor group a lower proportion (42.19%) of women were Meskan ethnic group compared to women in the not poor group (51.33%), (X^2 = 34.16; df (3); p < 0.001).

Concerning to maternal educational status a higher proportion (88.03%) of the study participants had no formal education compared to participants in the not poor group (63.88%), (X^2 =69.69; df (1); p < 0.001). In the poor group a higher proportion (90.47%) of participants were house wives or farmers compared to participants in the not poor group (83.65%), (X^2 = 7.59; df (1); p = 0.006).

Religious composition of the sample was also described, a higher proportion (80.93%) of women in the poor group were Muslim compared to those who were in the not poor group (71.10%), (X^2 = 14.34; df (3); p = 0.002).

More than half of women's husbands in the poor group compared to the two third of those whose husbands in the not poor group had completed primary school, (X^2 = 96.85; df (2); p < 0.001). Employment status of husbands were indicated with proportion (89.00%) of women's husbands in the poor group were unemployed compared to those whose husbands unemployed in the not poor group (78.46%), (X^2 = 15.11; df (1); p < 0.001).

Table 8 : Base line socio-demographic and socio-economic characteristics of women and their husband comparing poor versus not poor groups using Chi-Square test in rural Ethiopia, C-MaMiE study, Butajira (n = 756), 2005

Variables	Poverty (living standard conditions)		Chi2 (df) or T-test (df)	p-value
	Poor Number (%)	Not poor Number (%)		
Age group (years)				
15 -24	196 (39.76)	111 (42.21)	1.01	0.60 0
25 -34	229 (46.45)	122 (46.39)	(3)	
35-44	68 (13.65)	30 (11.41)		
Mean ± SD*	26.7 (6.4)	26.1 (5.8)	-1.28 (754)	0.89 0
Marital status				
Monogamous	386 (78.30)	215 (81.75)	1.40	0.510
Polygamous	103 (20.89)	45 (17.11)	(2)	
Others* *	4 (0.81)	3 (1.14)		
Place of residence				
Urban	7 (1.42)	104 (39.54)	198.99	< 0.00♦1
Rural	486 (98.58)	159 (60.46)	(1)	
Ethnicity				
Meskan	208 (42.19)	135 (51.33)	34.16	< 0.00 ♦1
Mareko	83 (16.84)	28 (10.65)	(3)	
Silti	145 (29.41)	41(15.59)		
Other [a]	57 (11.56)	59 (22.43)		
Maternal educational status				
Formal education	59 (11.97)	95 (36.12)	69.69	< 0.00 ♦1
No formal education	434 (88.03)	168 (63.88)	(1)	
Maternal occupation status				
Self or paid employee	47 (9.53)	43 (16.35)	7.59	0.006♦
House wife or farming	446 (90.47)	220 (83.65)	(1)	

Table 8 (continued)

Religion				
Muslim	399 (80.93)	187 (71.10)	14.34	0.003♦
Orthodox Christian	60 (12.17)	58 (22.05)	(3)	
Protestant	28 (5.68)	17 (6.46)		
Catholic	6 (1.22)	1 (0.38)		
Husband educational status				
Non educated	228 (46.44)	44 (16.92)	96.85	< 0.001♦
Primary school	251 (51.12)	171 (65.77)	(2)	
Secondary and above	12 (2.44)	45 (17.31)		
Employment status				
Employed	54 (11.00)	56 (21.54)	15.11	< 0.001♦
Unemployed	437 (89.00)	204 (78.46)	(1)	

* Standard Deviation, * * single, widowed, separated, [a]sodo, Oromo, Amhara♦significant at α = 0.05

Physical-ill health and social support characteristics of study participants

Study participants reported some physical-ill health and social support conditions during pregnancy (Table 9).

In the present study, the two cohorts were not statistically different related to physical-ill health and social support attributes. Less than one fourth of women in both cohorts with 85 (17.04%) in the poor group and 57 (21.67%) in the not poor group had experienced overall health problem.

With regard to malaria disease, 77 (15.71%) of women in the poor group and 36 (13.74%) of those in the not poor group had malaria. Similarly, less than three percent of women in both cohorts had been violated during pregnancy. Fifty five (11.46%) of women in poor group and 39 (15.12%) of those in not poor group had not been socially supported.

Table 9 : Physical-ill health and social support characteristics of women comparing poor and not poor groups using Chi-Square test in rural Ethiopia, C-MaMiE study, Butajira, (n = 756) 2005

Variables	Poverty (living standard conditions)		Chi2 (df)	p-value
	Poor Number (%)	Not poor Number (%)		
Overall health status				
Good or excellent	409 (82.96)	206 (78.33)	2.43	0.120
Average, poor or very bad	84 (17.04)	57 (21.67)	(1)	
Malaria				
Had no malaria	413 (84.29)	226 (86.26)	0.52	0.470
Had malaria	77 (15.71)	36 (13.74)	(1)	
Antenatal violence				
Not violated	481 (97.57)	261 (99.24)	2.64	0.160
Violated	12 (2.43)	2 (0.76)	(1)	
Social support				
Supported	425 (88.54)	219 (84.88)	2.02	0.160
Not supported	55 (11.46)	39 (15.12)	(1)	

Comparison of incidence of common mental disorders between poor and not poor cohorts

The incidence rate and rate ratio of maternal CMD were computed using person year observation and Poisson regression (Table 10). A total of 756 study participants contributed a cumulative total of 4413.75 person-years of observation (PYO) to this study; the poor group contributed 2855 PYO and the not poor group contributed 1558.75 PYO. In the poor group, 101 (13.4%) of women experienced CMD in the subsequent time points, which represented a higher percentage than the 40 women (5.3%) who developed CMD in the not poor group. More than half of the study participants 96 (53.04%) developed CMD within 2.5 year time point.

CMD incidence rate ratio was 1.38 (95% CI: 0.95, 2.04) times higher among women who had experienced poor in living standard conditions (poverty) compared to those who had not poor; the CMD incidence rate was also computed; in the poor and the not poor groups were 35.38 per 1000 person-years of observation, (95% CI: 29.11 - 42.99) and 25.66 per 1000 person-years of

observation (95% CI: 18.82 - 34.98) respectively. However, there was no statistically difference between the poor and the not poor groups in terms of both incidence rate ratio and incidence rate. The overall incidence rate of CMD during follow up time points was 31.94 per 1000 person-years of observation with 95% CI of (27.08, 37.68). The mean time to CMD was 3.04 year in the poor group and 2.73 year in the not poor group.

Table 10 : Comparison of incidence of maternal CMD between the poor and not poor cohorts of women in rural Ethiopia, C-MaMiE study, Butajira, (n = 756) 2012

Outcome measure	**Status of poverty (living standard conditions)**		
	Poor (95% CI)	**Not poor (95% CI)**	**Total (95% CI)**
Incidence CMD	101	40	141
Person-years Observation	2855	1558.75	4413.75
Incidence rate	35.38 (29.11 - 42.99)	25.66 (18.82 - 34.98)	31.95 (27.08 - 37.6
Incidence rate ratio	1.38 (0.95 - 2.04)		

CMD: Common Mental Disorder, CI: Confidence Interval

The CMD incidence rate among the poor and the not poor groups with 95 percent confidence intervals across various socio-demographic characteristics of women and their husbands, maternal physical health and social support are presented in Table 11.

The levels of CMD incidence rates were almost similar across the age groups of 15-24, 25-34 and 35-44 years with 23.8, 39.2, and 33 per 1000 person-years of observation respectively. CMD incidence rate was also similar among women who were living in monogamous, polygamous and others types of marriage with a level of 34.5, 22.5, and 23.8 per 1000 person-years of observation respectively. The CMD incidence rates were 30.8 and 36.7 per 1000 person-years observation among women who had no formal education and who had formal education respectively.

CMD incidence rate was almost similar among women who were house wives or farming and self or paid employee with 32.1 and 31.1 per 100 0 person-years observation respectively. CMD rates of 32.8, 32.1 and 29.8 were documented among women whose husbands educational levels of no-education, completed primary school and completed secondary and above respectively.

CMD incidence rates between employed and unemployed women's husbands had also not different with a level of 31.1 and 32.4 respectively.

There were more CMD incidence rates among women who had overall health problem compared to those who had not experienced the health problem with a level of 56 and 26.9 per 1000 person-years of observation respectively. With respect to malaria disease, the CMD incidence rate was higher among women who had malaria compared to those who had not experienced it with a level of 43.9 and 30 respectively.

CMD incidence rate was not variable across social support. Respective CMD rates were 33.3 and 32.12 person-years among women who had not been supported regarding to child care, frequency of contact with friends and family, and home work compared to those who had been provided enough support. The CMD rate was higher among women with poverty compared to those without poverty with 35.38 and 25.7 respectively. Respective CMD rates were also estimated at 36.4 and 31. 9 incidents per 1000 person -years of observation among women who had antenatal violence compared to those who had not violated.

Model 2: poverty causing maternal CMD

Results from crude and adjusted effects of primary independent variable and other covariates on the incidence of CMD are presented in Tables 11 and 12. In the bivariate analysis, the odds of CMD were 1.71 with 95% CI of (1.14, 2. 56) times higher among women who were in the age group of 2 5 – 3 4 year compared to those age group of 1 5 -2 4 years.

There was also observed an association of incidence of CMD with overall maternal health condition. The odds of CMD were 2 .3 1 with 9 5 % CI of (1 .5 2 - 3 .5 2) times higher among women who had general health condition problem compared to those who had not experienced it.

In the fully adjusted model, there was statistically significant association between poverty and maternal CMD in the subsequent time points. The primary exposure (poverty) which was previously non-significant (OR: 1.44, 95% CI: 0.96 – 2.15) in the bivariate analysis when it was modeled in multivariate; an association was seen with incidence of maternal CMD in the full adjusted model.

W omen who were poor in pregnancy were more likely to develop CMD symptoms with increasing odds of 1 .5 3 with 9 5 % CI (1 .0 2 , 2 .3 1) than those who were not poor. There was also statistically significant association between CMD and maternal characteristics and health condition. The odds of CMD were 0 .5 4 (9 5 % CI: 0 .3 2 – 0 .9 2) times higher among women living in polygamous marriage compared to those who were living in monogamous marriage. The study also documented statistically significant association of CMD with maternal physical-ill health. The odds of CMD were 2.16 with 95% CI of (1.40 - 3.33) times higher among women who had overall health problem compared to those who did not experienced the health problem. Similarly, the present study was find an evidence that the odds of maternal CMD were 1 .6 9 (9 5 % CI: 1 .1 1 - 2 .5 7) among women who were in the age group of 2 5 – 3 4 years compared to those in the age group of 15 -24 years . There was no statistically significant association between CMD and malaria disease in the multivariate analysis, this could be due to one episode of malaria rather it would be better when the study considered frequency of malaria contracted.

Table 1 1 : Crude odds ratio and CMD incidence rates per 1 0 0 0 person-years observation among women in rural Ethiopia, C-MaMiE study, Butajira, (n = 756) between 2005 and 2012

Variables	Number at risk	Number of CMD	Incidence of CMD per 1000 PYO (95% CI)	Crude OR (95% CI)
Age group (years)				
15 -24	307	44	23.8 2 (17.7 2 - 32.01)	1
25 -34	351	78	39.18 (31.38 - 48.92)	1.71 (1.14 - 2.56)
3 5 -4 4	9 8	1 9	3 3 .0 0 (2 1 .0 4 - 5 1 .7 4)	1 .4 4 (0 .7 9 - 2 .6 0)
Marital status				
Monogamous	6 0 1	1 2 0	3 4 .4 6 (2 8 .8 1 - 4 1 .2 1)	1
Polygamous	1 4 8	2 0	2 2 .4 9 (1 4 .5 1 - 3 4 .8 7)	0 .6 3 (0 .3 8 - 1 .0 5)
Others*	7	1	2 3 .8 1 (3 .3 5 - 1 6 9 .0 3)	0 .6 7 (0 .0 8 - 5 .6 0)
Maternal educational status				
Formal education	1 5 4	3 2	3 6 .6 6 (2 5 .9 2 - 5 1 .8 4)	1
No formal education	6 0 2	1 0 9	3 0 .7 8 (2 5 .5 1 - 3 7 .1 4)	0 .8 4 (0 .5 4 - 1 .3 1)
Maternal occupation status				
Self or paid employee	90	16	31.11 (19.06 - 50.79)	1
House wife or farming	666	125	32.0 6 (26.90 - 38.19)	1.07 (0.60 - 1.89)
Husband educational status				
Non educated	272	52	32.7 8 (24.98 - 43.02)	1
Primary school	4 2 2	7 9	3 2 .1 2 (2 5 .7 7 - 4 0 .0 5)	0 .9 7 (0 .6 6 - 1 .4 4)
Secondary and above	5 7	1 0	2 9 .7 8 (1 6 .0 3 - 5 5 .3 6)	0 .9 0 (0 .4 3 1 .8 9)
Husband employment status				
Employed	110	20	31.10 (20.07 - 48.21)	1
Unemployed	6 4 1	1 2 1	3 2 .3 7 (2 7 .0 9 - 3 8 .6 8)	1 .0 5 (0 .6 2 - 1 .7 7)
Overall maternal health status				
Good or excellent	615	98	26.8 8 (22.05 - 32.76)	1
Average, poor or very bad	141	43	56.01 (41.54 - 75.53)	2.31 (1.52 - 3.52)

Table 11 (continued)

Malaria					
Had no malaria	639	113	30.12	(25.05 - 36.22)	1
Had malaria	113	28	43.979	(30.37 - 63.69)	1.53 (0.96 - 2.46♦)
Social support					
Supported	644	121	32.12	(26.88 - 38.38)	1
Not supported	94	18	33.25	(20.95 - 52.78)	1.02 (0.59 - 1.78)
Poverty status					
Not poor	263	40	25.66	(18.82 - 34.98)	1
Poor	493	101	35.38	(29.11 - 42.99)	1.44 (0.96 - 2.14♦)
Antenatal violence					
Not violated	742	138	31.86	(26.96 - 37.65)	1
Violated	14	3	36.40	(11.74 - 112.86)	1.19 (0.33 - 4.34)

*single, widowed, separated, ♦variables significant at $\alpha \leq 0.20$ included in the adjusted model

CMD: Common Mental Disorder

Table 12 : Crude and adjusted incidence of CMD along with 95% confidence interval among women in rural Ethiopia, C-MaMiE study, Butajira (n = 756) between 2005 and 2012

Variables	Crude OR (95% CI)	Adjusted OR (95% CI)
Age group (years)		
15 -24	1	1
25 -34	1.71 (1.14 - 2.56)	1.69 (1.11 - 2.57)♦
35-44	1.44 (0.79 - 2.60)	1.57 (0.85 - 2.90)
Marital status		
Monogamous	1	1
Polygamous	0.63 (0.38 - 1.05)	0.54 (0.32 - 0.92)
Others*	0.67 (0.08 - 5.60)	0.81 (0.09 - 6.87)
Overall maternal health status		
Good or excellent	1	1
Average, poor or very bad	2.31 (1.52 - 3.52)	2.16 (1.40 - 3.33)♦
Malaria		
Had no malaria	1	1
Had malaria	1.53 (0.96 - 2.46)	1.33 (0.81 - 2.17)
Poverty status		
Not poor	1	1
Poor	1.44 (0.96 - 2.14)	1.53 (1.02 - 2.31)

♦adjusted for age group and maternal overall health problem, * Single, widowed, separated
CMD: Common Mental Disorder

6. DISCUSSION

This retrospective cohort study from rural Ethiopia tried to investigate the independent effect of maternal CMD in pregnancy upon poverty and in the other hand, effect of poverty upon CMD. Its objectives were to assess incidence of maternal CMD, incidence of poverty and temporal relationship between poverty and maternal CMD in the subsequent time points.

Given that the cohort of mothers has been followed-up in time points yielding a wealth of data; the study is assured that the study findings are representative of the rural population of Butajira, DSS.

The incidence rates of poverty and CMD in the exposed groups of both pathways were 73.39 per 1000 PYO and 35.38 per 1000 PYO, respectively. Although the difference was not statistically significant between groups in each pathway; the magnitude of incidence rate of poverty was slightly higher than incidence rate of CMD in the poor group. Incidence rate of CMD in the present study was higher than incident cases of common mental disorder in India (77).

The present study did not find evidence of an independent effect of maternal CMD in pregnancy upon incidence of poverty over time. Studies from LAMIC have shown that the relationship of maternal CMD and poverty move in both directions for most mental illnesses (7, 25), and mechanisms of this relationship are also complex and multidimensional (7). A study investigating community and facility based epidemiological literature of the last 19 years in LMIC indicates that the evidence for poverty causing CMD does not preclude the possibility that CMD may cause poverty. There was absence of evidence from cohort studies that explored the impact of CMD on poverty status (7).

Even though there was variation in measuring poverty among studies, similar finding has been found in developed country (Massachusetts) that downward economic mobility among psychiatric patients (moving to more or less favorable community and employment condition), all of these were no statistically significant or negligible downward drift (73). Another study from Epidemiologic Catchment Area program of Eastern Baltimore, in bivariate analysis, the

effect of depressive syndrome doubled the odds of financial dependency at follow up, but the odds ratio was not significant (63).

The mental disorders causing poverty pathway has been hypothesized that appropriate for major mental disorders particularly for schizophrenia (97); there is little evidence of this downward drift in people with other psychiatric disorders (28). However, the SRQ -20, which was used in the present study; is a scale-based measure of maternal CMD symptoms, rather than providing a definitive diagnostic assessment of mental disorder (8 9) and assessing CMD as a whole through a screening tool (7). This implies that mental disorder results in deterioration in functioning to such an extent that the individual drifts down to a lower SES.

By taking into account these concepts and suggestions, the negative finding of the present study with regard to CMD causing poverty might be related to; firstly, poverty measure was treated differently at base line and follow up time points, in line with this, oversimplified measure of poverty was also employed (having two or more self-report on various poverty indicators); this variability might explain the association to be non-significant. Secondly, the small number of CMD cases in pregnancy (1 2 %) might have limited the power of the study to find a true association with incidence of poverty.

Thirdly, evidences have shown that maternal CMD causing poverty pathway is linked to increased health expenditure, reduced productivity, lost employment/lose their existing job or denied work opportunity (6 8 , 7 1); however, the present study had no access to these proxy poverty indicators, moreover, the expenditure of health services of the study participants, including their children have been covered by C-MaMiE project for the last six or seven years. In addition, the study was conducted in a predominantly rural setting area where the job opportunity and paid employment status are less. These might be explained in detecting the true difference of association between poverty and CMD. Although an alternative explanation is reporting sampling error and this appear to be at least partially a factor of study quality.

With respect to this CMD causing poverty pathway; husbands' educational level, but not the educational level of the women themselves, was important predicator of poverty. Women whose

husbands' educational levels above primary school were less likely to report poverty than those whose husbands' had no education. This association demonstrated a dose–response relationship that as husbands' educational level increases from primary to secondary and above; the likelihood of women reporting poverty reduces by a 30% from the level of poverty in primary school category. This could be due to creating job opportunity and income generating activities. The study did also find a statistically significant association of incidence of poverty with poor social support. Women who had not been supported regarding to children care and home work were 1.7 times more likely to experiencing of poverty than those who had been provided enough help. Exclusion from social activities reduces the ability of the people to escape poverty (60).

In the other way round, the present study was able to show association between poverty and maternal CMD with regard to reverse direction of relationship (poverty causing CMD). In addition, it was also able to replicate findings of association between poverty and CMD. Similar finding was found in Massachusetts, a longitudinal statewide ($p < 0.001$) that the poorer one's socioeconomic conditions are, the higher one's risk is for mental disability and psychiatric hospitalization regardless of the particular indicators of SES or type of mental illness examined (73). Another study from India that the effect is through economic deprivation on occurrence and chronicity of depression (76); in SSA and other LMIC; narrative studies, including systematic review from these settings have shown that poverty and mental illness have been linked (26) and social and economic conditions of poverty are linked with CMD (7, 27).

A similar finding from a cohort study in Pakistan has shown that women in the low SES category are three times as likely to have postnatal depression at 12-month follow-up than those in a higher SES category ($p < 0.05$) and has also found evidence that SES may be temporally linked to CMD (78). A cohort study in India has shown that women with lack of tap water in the house were two times more likely to have incidence of CMD in 12-month follow up than those who have (77),but among elderly Nigerians where SES, housing conditions on the basis of "hard" versus "earth" floor was inversely associated with life time depression (with those living with earth floors at decreased risk) (79).

With regard to food insecurity, a cohort study has shown that hunger in the last 3 months and financial stress (with those expressing difficulty making ends meet) among women in India were associated with 12-month incidence of CMD (77).
In a study examining community-based data in five countries revealed that poverty is not a strong determinant of poor mental health and mental health implies that poor mental health is not a ''disease of affluence'', neither is it a disease of poverty (4).

With regard to poverty causing CMD, this study found evidence of some base line variables independently associated with incidence of CMD. Women who had overall health problem were 2.16 times more likely to have CMD than those who did not experience the illness. This result is consistent with a study from LAMIC setting indicates that individuals with poor physical health are more likely to report worse mental health (4). A study conducted in India has also shown that chronic physical illness was associated with maternal CMD (p-value = 0.04).
However, the current finding is inconsistent with a recent Ethiopian national report on development and poverty that indicate richer households that are more likely to report an illness episode (50).

Polygamous marriage was also associated with maternal CMD; women living in polygamous marriage were 0.46 times less likely to develop CMD. This variable was evaluated as gender disadvantage in C-MaMiE study in Butajira (96); one possible explanation, it could be a common practice in Muslim population, majority of the study participants (80%) in this study were from this religion, polygamous women might be relatively autonomous and/or alternative explanation is reporting sampling error. This is not concordance with finding from Kilimanjaro Region of Tanzania (p = 0.048) (87).

Women who were in the 25-34 years age group more likely to have CMD than those who were in the 15-24 years age group, but a quasi-experimental study in Pakistan, all mother's age group (reference: < 25 year) are not associated with postpartum anxiety and depression. Another study indicates that no association found between depression (antenatal and post-natal) and older age group (≥ 30) (86).

7. STRENGTHS AND LIMITATIONS OF THE STUDY

7.1 Strengths

This retrospective study reduced the risk of selection bias and produce relatively valid results.

The study conducted both directions of relationship between poverty and maternal CMD at vicious cycle level; this could be creating a good opportunity to see the relationship at same time.

As the sample was community rather than health facility-based, it was more likely to be representative of the rural population.

7.2 Limitations

There are several limitations to this study. Firstly, the concept of poverty used was poorly operationalized, oversimplified measure and was not a standardized or validated method. Secondly, poverty measure at base line and follow up time points was treated differently.

This study has also limitation on probably the most involves the indicators of maternal CMD and poverty used, which relied on the opinions of study participants and Although no formal health education was provided through the C-MaMiE project, it is probable that repeated questionnaires asking about health topics and other assessment methods, increased awareness about related health issues and recommended health behaviours.

The present study was unable to compare adequately particularly for CMD causing poverty with previous studies due to limitation of similar literature.

This study did not have access to specific data on chronic diseases that have been associated with mental illnesses as result in the potential confounding variables used in this analysis were on the basis of recruitment phase.

8. CONCLUSION AND RECOMMENDATIONS

8.1 Conclusion

In this study, there was no statistically significant independent effect of maternal CMD in pregnancy upon incidence of poverty over time but reverse direction of relationship between poverty and CMD was likely to be associated with maternal CMD.

This study found social support and husbands' educational level were important predicators of incidence of poverty and overall maternal health condition, age and polygamous marriage were major predicators of incidence of maternal CMD over time.

8.2 Recommendations

W ith these findings, the following recommendations are made:

A great deal of attention is now being given to maternal health in Ethiopia, by seiz ing this opportunity; the relationship among maternal mental health, physical-ill health and poverty could be addressed through integration into maternal health care approach by health sector and other partners.

Mental health and poverty linkage should be brought to the attention of policy makers in the rural settings to ensure that mental health promotion is integrated into the policies, potential strategies and programmes of all sectors involved in poverty alleviation and community development.

Further research is required to investigate maternal CMD lead to poverty causality using standardized and valid poverty measure relevant to rural Ethiopian context and exploring of direct and indirect pathways of this relationship.

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Annex I: Check list of variables related to characteristics of women and husband, physical-ill health, CMD, social support in C-MaMiE study, Butajira, Ethiopia between 2005 and 2012

1. PERSONALDETAILS				
No	**Variable**	**Response (original code)**	**New code**	**Remark**
001	Age	_____Years	Age group* 15-24 25-34 35-44 45-49	
002	Marital status**	Polygamous(2 , 3 , or 4 wives) Divorced Separated Never Married W idowed	Monogamous Polygamous Other	
003	Ethnicity	Meskan Mareko Silti Other (specify)_____		
004	Religion	Muslim Orthodox Protestant Catholic Other (specify)_____		
005	Place of residence	Urban Rural		
006	Maternal education**	None Informal only formal Refused/ no answer	No formal education Formal education	
	Grade	(Specify)_____		
007	Occupation**	1. Farming 2. Trading / related occupation 3. Animal Husbandry 4. managerial /administrative 5. Transport 6. Craftsmen / related production 7. Labourer 8. Student 9. Unemployed 10. Housewife 11. Other (specify) 12. Refused / no answer	House wife or farming Self or paid employee	

2. Socio-economic status			
0 0 8	Hungry in the last month due to lack of resources	Yes No	
0 0 9	Debts that cannot pay	Yes No	
0 1 0	No resources to deal with an emergency	Yes No	
0 1 1	Subjective report of relative wealth* *	less more the same dont know refused / no answer	More or the same Less wealth than others
0 1 2	Asset possessions	**Yes** (own by self or with others) **No** (dont own or dont have) ➢ Land ➢ Your house (owner ship status) ➢ A company or business ➢ Large animals (cows, horses) ➢ Small animals (chickens, pigs, goats, sheep etc.) ➢ Produce or crops from certain fields ➢ A bed ➢ A radio ➢ Jewellery, gold or other valuables ➢ Other property (specify)	
0 1 3	**Living standard conditions**	Unprotected water source (River, unprotected, lake, pond and unprotected spring) ➢ Yes/No opening window in home ➢ Yes, a small opening, open & closable ➢ No Housing conditions (Roof material)* * ➢ Thatched ➢ Corrugated iron sheet ➢ Other (specify) Mode of sanitation **Toilet facility**** ➢ Private	Thatched Corrugated iron sheet

		➢ Shared	Used sanitation facility
		➢ Public	Not used sanitation
		➢ Field	facility
		family refuse disposal* *	
		➢ W aste disposal pit	Buries, burn and others
		➢ Open field	Disposed on field
		➢ Burning	
		➢ Fertiliser for fields	
		➢ Other (specify)	
		3. Physical health problems	
0 1 4	Self-reported maternal health	Maternal illnesses (> 1 day)	
		Fever* *	
		➢ None or one or more	Had fever
		Malaria* *	Had no fever
		➢ None or one or more	Had malaria
		Diarrhoea* *	Had no malaria
		➢ Not had	
		➢ Not bothered at all	Had diarrhoea
		➢ Bothered a little	Had no diarrhea
		➢ Bothered a Lot	
		Self-reported global heath	
		➢ Average, poor or very bad	
		➢ Good or excellent	
		4. community & social support	
0 1 5		Sees family less than weekly	
		Sees friends less than weekly	
		Not enough help with house work	
		Not enough help after looking children	
		➢ Yes	
		➢ No	
		➢ Dont know	
		➢ Refused / No answer	
		5. Stressful life events	
0 1 6	Antenatal violence	➢ Yes	
		➢ No	

6 .Community and social support			
0 1 7	Marital relationship	Husband not providing enough help ➢ Yes ➢ No	
		Overall relationship (marital discord scale)* * ➢ Very good ➢ good ➢ Average ➢ Bad ➢ Very bad	Average, bad or very bad Good or very good
		Q uarrel with husband* * ➢ Rarely ➢ Sometimes ➢ Often ➢ Never happened ➢ Dont know ➢ Refused / No answer	Rarely or never happened Sometimes or often
		W oman thinks husband drinks too much alcohol ➢ Yes ➢ No	
	Social support* *	Sees family less than weekly Sees friends less than weekly Not enough help with house work Not enough help after looking children ➢ Yes ➢ No ➢ Dont know ➢ Refused / No answer	Poor social support Not poor social support
7. Maternal Common Mental Disorders			
018	Maternal CMD symptoms (total score SRQ - 2 0 score)* *	Score ‘0 ’ _____Number Score ‘0 - 5 ’_____Number Score ≥ ‘6 ’_____ Number	
	Maternal CMD case (SRQ ≥ 6)* *	_____Number	

* Age group category from N. Deyessa et al., Scandinavian Journal of Public Health, 2008 , **C - MaMiE study, Hanlon et al., the British Journal of Psychiatry (2010)

Annex II: SELF REPORTING QUESTIONNAIRE (SRQ)

SRQ-20: a copy of the English version of self reporting questionnaire-20 is shown below.

1 . Do you often have headaches?	Yes/no
2 . Is your appetite poor?	Yes/no
3. Do you sleep badly?	Yes/no
4. Are you easily frightened?	Yes/no
5 . Do your hands shake?	Yes/no
6 . Do feel nervous, tense and worried?	Yes/no
7 . Is your digestion poor?	Yes/no
8 . Do you have trouble thinking clearly?	Yes/no
9 . Do feel unhappy?	Yes/no
1 0 . Do you cry more than usual?	Yes/no
11. Do you find difficult to enjoy your daily activities	Yes/no
12. Do you find difficult to make decisions?	Yes/no
13. Is your daily work suffering?	Yes/no
14. Are you unable to pl ay a useful part in life?	Yes/no
1 5 . Have lost interest things?	Yes/no
1 6 . Do you feel that you are a worthless person?	Yes/no
1 7 . Has the thought of ending your life been on your mind?	Yes/no
1 8 . Do you feel tired all the time?	Yes/no
1 9 . Do you have uncomfortable feelings in your stomach?	Yes/no
2 0 . Are you easily tired?	Yes/no

Annex III: DECLARATION

I, the undersigned, declare that this is my original work and has never been presented in this or any other University and that all the source materials used for this thesis have been duly acknowledged;

Name: _____

Signature: _____

Place: _____

Date of Submission: _____

The thesis has been submitted for examination with my approval as a University advisor.

Name: _____

Signature: _____

Date: _____