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Quality of life after maternal near miss: A systematic review

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Conflicts of interest
None

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ABSTRACT

Introduction: Maternal near miss is a major global health issue and approximately seven million women worldwide experience it each year. Maternal near miss can have several different health consequences and affect the women’s quality of life, yet little is known about the size and magnitude of this association. The aim of this study was to assess the evidence of the association between women who have experienced maternal near miss and quality of life compared to women who had an uncomplicated pregnancy and delivery.

Material and methods: Cochrane library, Embase, CINAHL, Web of science, Medline, Scopus and PubMed were searched for published studies. Studies were selected according to the PECO model (population, exposure, control, and outcome), and were included if they investigated quality of life as an outcome after maternal near miss among women of all ages with no limitation on country or time (up to June 2020). Maternal near miss was defined as a life-threatening condition arising from complications related to pregnancy and/or childbirth. The quality of the studies was assessed according to the Newcastle-Ottawa scale and a forest plot was constructed based on quality of life outcomes and study quality.

PROSPERO registration number: CRD42020169232.

Results: Fifteen studies were included in the review with a total of 31,558 women. Quality of life was reported in various ways, and 25 different confounders were controlled for. Compared to women who did not experience maternal near miss, women exposed to maternal near miss had an overall lower quality of life (n=2/2), had poorer mental (n=6/10) and social health (n=2/3) and maternal near miss had negative economic consequences (n=4/4). Maternal near miss was not associated with sexual dysfunction (n=1/5). Ten out of fifteen studies were assessed as being of poor quality.

Conclusions: Evidence shows that maternal near miss is negatively associated with various aspects of quality of life. This highlights the importance of addressing the adverse effects associated with maternal near miss and follow up maternal near miss after discharge. Quality of life is a multidimensional concept that is assessed in various ways, and the literature on the field is heterogenous. More high-quality studies are needed.

Keywords

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Maternal near miss, quality of life, maternal morbidity, mental health, pregnancy, childbirth, termination of pregnancy, posttraumatic stress disorder

Abbreviations

MNM maternal near miss
QoL quality of life
WHO World Health Organization

Key message

Maternal near miss is negatively associated with quality of life overall, mental, and social health and has negative economic consequences. The studies included in our systematic review were of poor quality, and further studies within the field are warranted.
INTRODUCTION

Maternal near miss (MNM) is a major global health issue. The World Health Organization (WHO) defines MNM as “a woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy” (1). Further according to the WHO, approximately seven million women worldwide experience MNM each year due to an injury, infection, disease or disability related to their pregnancy (2). MNM can have several different health consequences and affect the women’s quality of life, yet little is known about the size and magnitude of this association.

Overall, quality of life (QoL) is defined very broadly as “an individual’s perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns” (3). In order to measure this complex and multidimensional concept, WHO has developed a questionnaire – referred to as WHOQOL-100 – which focuses on individuals’ view of their personal well-being, including physical health, psychological state, level of independence, social relations, environment (e.g. financial resources) and personal beliefs (3). In this paper, we only address women’s QoL, not their partners’. It is important to understand how MNM affects QoL to be able to minimize the health consequences and plan for future interventions. To the best of our knowledge, no systematic reviews have so far examined the association between QoL and MNM and provided an overview of the literature in the field. Previous reviews have been conducted, yet, they are either non-systematic (4,5) or only cover parts of the concept of QoL, such as sexual dysfunction, posttraumatic stress disorder and needs of the women after MNM (6–8).

Therefore, the aim of this systematic review is to provide an overview of the literature on MNM and QoL and examine the evidence for the association between MNM and overall QoL as well as specific elements of QoL, namely mental, social and sexual health as well as economic costs.

MATERIAL AND METHODS

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Protocol and registration

This systematic review was protocol-driven and registered in PROSPERO (ID: CRD42020169232). It is reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines.

Eligibility criteria

Studies were selected according to the PECO model (population, exposure, control, and outcome) and study design. Studies were included if they were observational and investigated QoL as an outcome after a MNM among women of all ages with no limitation on country or time. Further, MNM was defined as a life-threatening condition arising from complications related to pregnancy and/or childbirth up to 42 days after termination of pregnancy. Studies that assessed maternal mortality were excluded. When possible, we distinguished between results from women with live birth and women who had experienced an intrauterine or perinatal death. The control group was defined as women who had an uncomplicated pregnancy and delivery of a live child. QoL was defined as a multidimensional outcome entailing physical health, mental health, economic situation, social aspects, and sexual dysfunction. Study designs were limited to quantitative studies; hence, qualitative studies were excluded. Further, poster abstracts and non-English publications were excluded.

Information sources and study selection

Seven databases were searched for literature: Cochrane library, Embase, CINAHL, Web of science, Medline, Scopus and PubMed, and experienced librarian was consulted in the development of the search strategies (Supporting Information Appendix S1). After removal of duplicates, two authors (IWvR, RSH) independently conducted a title-abstract screening of publications followed by full-text screening (IWvR, RSH) by use of Covidence (www.covidence.org). Any disagreement that arose was resolved through discussion. Two authors (BMC, RSH) extracted data of the included publications into a standardized excel template. The following data were extracted: Characteristics of study participants, year of study, country setting, time elapsed after near-miss, sample size, study design, near-miss definition, tool
for measurement of QoL, loss to follow-up, confounders controlled for, and study outcomes. The outcome data were verified by one author (BMC).

Quality assessment

The Newcastle Ottawa scale (NOS) was used to assess the quality for cohort studies. Quality assessment was conducted independently by two authors (IWvR, BMC). Newcastle Ottawa scale evaluates (1) selection, (2) comparability, and (3) outcome, through nine questions with a maximum score of nine stars for cohort studies. The quality of the studies was judged as having good, fair, or poor quality according to the following criteria: Good quality: three or four stars in selection domain AND one or two stars in comparability domain AND two or three stars in outcome/exposure domain. Fair quality: two stars in selection domain AND one or two stars in comparability domain AND two or three stars in outcome/exposure domain. Poor quality: zero or one star in selection domain OR zero stars in comparability domain OR zero or one star in outcome exposure domain. Results for MNM and various QoL outcomes were summarized in a forest plot (figure 3).

RESULTS

The literature search was performed in June 2020 and a total of 4502 records were identified. After duplicate removal (n=2548), 1898 records were excluded after title-abstract screening, leaving 56 publications for full-text screening. Forty-one studies were excluded because they did not live up to the inclusion criteria, which led to an inclusion of 15 cohort studies (9–23) (figure 1).

The included studies were published between 2008-2020. Although the country of origin differed greatly between the studies, the majority were set in Africa (n=8) (10–12,15–17,22,23) and South America (n=5) (9,13,18–20), whilst one study was set in Europe (Sweden) (21) and one in Asia (India) (14) (Table 1). A total of 31558 women were enrolled in the studies. In eight studies, the population age was reported as a mean ranging between 25.3-27.7 for MNM, 25.6-27.5 for no MNM (11,14,23) and 25.6-28.0 for joint mean (10,12,16,17,22). The remaining seven studies reported age as an interval between ≤19 - ≥40 (9,13,15,18–21). Time to follow-up ranged...
between five months to five years. Twenty-five different confounders were adjusted for in seven studies, within the following domains: economic status, education, maternal health and lifestyle, marital status, location, social relations, place of recruitment, characteristics of infant and previous pregnancies/deliveries (10,11,16,17,21–23). All the included articles defined MNM in conformity with WHO’s definition (1). Yet, some of the studies used the term “severe maternal morbidity” (9,14,18–21) rather than MNM, but the definition was the same as for MNM.

Outcome measurement

A series of different instruments were used to measure QoL. Five studies assessed QoL through the WHOQOL-BREF questionnaire (10,14,15) or SF36 questionnaire (9,19). Eight studies (11,14,16–18,20,22,23), solely focused on mental health as a proxy measure for quality life, and used the following tools to measure it: K10 (11,17,22,23), Edinburgh postpartum depression scale (14,16), Post traumatic stress disorder civilian checklist (18), or the Alcohol, Smoking, and Substance Involvement Screening (ASSIST) test (20). Economic aspects of QoL were assessed in various ways, e.g. through hospital bills and food insecurity by use of the Maxwell food insecurity grid (10). The female sexual function index (FSFI) was used as tool to measure sexual health (9,13).

Overall QoL

Two studies reported overall QoL after MNM (table 1) (10,15) and both studies found that women who had experienced MNM had a lower QoL compared to women who had not experienced MNM (mean MNM: 3.56 ± 0.9 SD vs mean none-MNM: 4.47 ± 0.6 SD; p< 0.001) (15) (QoL-coefficient -0.154, p 0.003) (10).

Mental health after MNM

Ten studies reported outcomes on MNM and mental health (table 1) (9,14–22), and six studies found that MNM affected various aspects of mental health negatively (14,16–18,21,23). Two studies assessed thoughts on suicide and found an increased risk among women exposed to
MNM (18.4% vs 0%, p: 0.001 (14); aOR: 2.44, 95% CI: 1.14–5.20 (17)□); one study found an increased risk of psychiatric condition (OR 1.22; 95% CI 1.03–1.45) (21)□, and one study found a higher risk for depression (aOR: 4.08; 95% CI: 1.85–8.99) (16)□. Further, one study found lower psychological well-being among the MNM group (mean $^{\text{MNM}}$: 21.9 ± 3.6 SD vs mean $^{\text{none-MNM}}$: 26.0 ±2.7 SD; p <0.001) (15)□. The four studies that did not find an association between MNM and mental health, investigated K10-score (mean $^{\text{MNM}}$: 4.37, mean $^{\text{uncomplicated delivery}}$: 4.15, p: 0.003) (22), posttraumatic stress disorder (OR: 1.09; 95% CI: 0.77–1.56) (18), drug use (exposed: 27.3% vs non-exposed: 24.5%, p: 0.41) (20) and mental disorder such as depression, anxiety and schizophrenia (exposed: 22.7 % vs non-exposed: 16.8 %, p: 0.076) (9)□.

Economic consequences of MNM

Four studies investigated the economic consequences of MNM, and all of them reported significant difference between groups (table 1) (10,12,17,22)□. Two studies found that the MNM-group were more likely to accumulate hospital debt (aOR: 3.91, 95% CI: 1.46–10.48 (17)□; 17.69 % vs 1.73 %, p < 0,001 (22)□), and two studies found higher hospital costs in the MNM-group compared to the control (10,12)□. Specifically, studies from Burkina Faso found that households of near miss women paid more than twice the amount for hospital delivery compared to the cost of uncomplicated deliveries (10) and that expenditures for uncomplicated deliveries represented 5.1% of annual gross domestic product per capita whilst it for near miss represented 12.7 % (12). Further, Storeng et al found that MNM patients were more likely to sell their assets (11.2 % vs 2.5 %; p: < 0.001), borrow money (30.5% vs 7.9%), spend their savings (32.1 % vs 12.6 %) and be affected by food insecurity (15.7 % vs 9.7 %; p: 0.009) compared to controls (12)□.

Sexual health and MNM

Five studies assessed sexual dysfunction (table 1) (9,11,13,16,23),□ out of which three examined dyspareunia (11,16,23)□ and one pelvic pain (9)□. Four out of five studies did not find a significant difference between MNM and non-MNM patient (9,11,16,23)□, whilst one study found a longer time interval before resumption in sexual activity in the MNM-group compared to the control (84 days vs 65 days) (13)□.
Three studies examined social aspects following a MNM (table 1) (15,17,23). One study found no difference between women who experienced MNM and women who had a normal delivery, regarding whether pregnancy had a negative effect on the woman’s life or made her feel blamed by someone close to her (aOR negative effect on life: 1.70; 95 % CI: 0.99-2.94, aOR felt blamed by someone close to her: 0.83; 95% CI: 0.27-2.53) (23), one study reported a lower score in the social domain of the exposed women compared to the non-exposed (mean MNM 11.0 ± 2.3 SD vs mean none-MNM 12.7 ± 1.9 SD) (15), and one study reported a higher prevalence of forced sexual relations four years after giving birth in the group with MNM compared to the group with normal delivery (aOR: 4.71; 95% CI: 1.04–21.3) (17).

Different obstetric conditions and their effect on QoL

Three studies examine whether the different obstetric conditions that caused MNM, resulted in different QoL (table 1) (15,18,21). Two studies reported no statistically significant difference in posttraumatic stress disorder (18) or overall QoL (15), when comparing the different reasons for MNM, although neither of the two studies presented any data to back up their assessment. One study found that women, who were diagnosed with shock or uterine rupture/obstetric laparotomy, were more likely to receive psychiatric treatments and psychotropic prescriptions post-partum (OR shock + psychiatric treatment: 28.53; 95 % CI: 3.76-215.46, OR shock + psychotropic prescription: 3.03; 95 % CI: 1.38-6.64, OR uterine rupture + psychiatric treatment: 2.85; 95 % CI: 1.62-5.02, OR uterine rupture + psychotropic prescription: 1.94; 95 % CI: 1.28-2.94) than those who did not have a MNM-diagnosis/procedure. Further, women who had a blood transfusion, cerebrovascular disease or cardiovascular disease were at higher risk of needing a prescription for psychotropic medication post-partum (OR blood transfusion: 1.27; 95 % CI: 1.11-1.46, OR cerebrovascular disease: 4.32; 95 % CI: 1.35-13.81, OR cardiovascular disease: 4.00; 95 % CI: 1.90-8.41), but were not at higher risk regarding postpartum psychiatric treatment. Organ failure, severe pre-eclampsia, eclampsia and sepsis did not result in any difference in need of neither psychiatric treatment or psychotropic prescriptions post-partum (21).
Neonatal outcome and QoL

Five of the included studies explored the association between perinatal death and QoL (11,13,16,22,23) within various QoL outcomes (table 1). Two studies found that women who had experienced MNM and perinatal death were at higher risk of developing depression than women who had experienced MNM but had a live birth (K10-score 6.86 vs 4.37, p 0.003)(22), (aOR \text{MNM + perinatal death}: 3.42; 95 \% CI: 1.30-9.01, aOR \text{MNM + live birth}: 1.04; 95 \% CI: 0.51-2.13)(23). Further, two studies found no difference in dyspareunia after birth between women with MNM and perinatal death compared to women with MNM and live birth (11,23). One study found that the female sexual function index -score did not differ with the outcome of the child, yet the mean time to resuming sexual activity was longer for MNM with live birth compared to normal delivery of live child (86.3 days vs 66.3 days, p: 0.019) and MNM with perinatal death and normal delivery with perinatal death (73.3 days vs 44.7 days, p: 0.437) (13). According to one study, the risk of developing post-partum depression was higher both among the women who experienced MNM with live births (aOR: 4.08; 95\% CI: 1.85-8.99) and MNM with perinatal deaths (a-OR: 4.7; 95 \% CI: 1.79-12.54), compared to uncomplicated delivery with live birth. Uncomplicated delivery with perinatal death did not have a significant higher risk of a high post-partum depression score (OR: 3.96; 95 \% CI: 0.95-16.41), and it was therefore concluded by the authors that perinatal mortality did not have a significant effect on psychological distress, but experiencing a MNM did (16).

Finally, one study found that women who experienced MNM and had a perinatal death were more likely to feel blamed by someone close to them (aOR: 9.03, 95 \% CI: 2.09-39.03) and to feel that the pregnancy has had a negative effect on their life (aOR: 4.11 95\% CI: 1.87-9.00), than women who experienced MNM but had a live birth (aOR felt blamed by someone close to her: 0.83; 95 \% CI: 0.27-2.53, aOR negative effect on life: 1.70; 95 \% CI:0.99-2.94), when compared to women who had an uncomplicated delivery (23).

Quality assessment of studies and forest plot

Overall, the quality of studies varied. Of the fifteen studies, ten were judged to be of poor quality (9,10,12–15,17–19,23), one to be of fair quality (20), and four to be of good quality (11,16,21,22) (Figure 2, Supporting Information Appendix S2). To help illustrate the heterogeneity across studies, the results are presented in a forest plot which is ordered by the risk of bias, placing higher-quality study findings above those with lower quality (figure 3).
DISCUSSION

This systematic review landscaped the evidence of the association between MNM and QoL. A total of 15 studies were included in the review, all of them cohort studies. It was found that MNM was negatively associated with QoL overall. MNM also had a negative impact on different aspects of mental and social health, as well as negative economic consequences. However, there was little documentation for an association between MNM and sexual health.

To our knowledge, this is the first systematic review of MNM and QoL. A strength of this study is that the review is conducted according to the PRISMA guidelines and that a thorough quality assessment was conducted by use of a validated tool (Newcastle Ottawa scale) (24). A limitation of this review is that QoL is a complex concept that consists of various sub-elements, hence, studies reported various outcomes related to QoL and measured them in different ways. Due to the heterogenous outcomes, it is challenging to provide an overall estimation of the association between MNM and QoL. However, if this limitation is taken into account it appears that there is evidence for MNM being negatively associated with QoL. Yet, one should bear in mind that the quality of the included studies overall was judged to be of poor quality, hence, the trust in the reported estimates is low and true estimates may differ from the ones reported in these studies. Therefore, we recommend further studies of high quality within the field.

When looking to various aspects of MNM, it was found that MNM is negatively associated with mental health. A significant proportion of the studies demonstrated an increased risk of suicidal thoughts, depression and increased risk of other psychiatric conditions (14–17,21–23). Yet, the methodological heterogeneity in these studies, including different duration of follow-up and different endpoint measures, makes it difficult to directly compare the studies. Hence, large scale prospective cohorts with clearly defined endpoints are warranted. Further, one should bear in mind that MNMs are often considered obstetric successes because ultimately the woman’s life is saved by a focused medical intervention (25). However, this review has shown that women are prone to experience long-term consequences following these complications. Hence, the women are likely to experience a substantial degree of physical and psychological morbidity. Further, women who survive a near-miss obstetric complication are also at increased risk of experiencing financial
problems due to a combination of health care-related and social factors (10,12,17,22). The
financial problems may be associated with the hospital expenditures allied with the MNM as well
as the loss of income due to the women’s postpartum morbidity.

In recent years, it has become evident that a well-functioning health care system and the
provision of a continuum of care for post-partum women is essential for maternal and child health
(26). This review highlights the importance of proper care for women who have experienced
MNM and the need for health care systems to address MNM in a multidimensional manner. This
includes prioritizing postpartum care and providing links between reproductive and sexual health
care services and maternal health care as well as handling the psychological consequences of
MNM. In addition, the social and economic determinants of MNM should be prioritized (27).
Supportive programs designed to follow-up MNM after discharge are warranted.

CONCLUSION
This systematic review demonstrates that MNM is negatively associated with QoL for the
women experiencing it. This highlights the importance of focusing on adverse effects associated
with MNM and supportive programs designed to follow-up MNM after the discharge are
warranted.

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Legends

Table 1: Description and results of included studies.

Figure 1: Flow chart of study selection in the review of quality of life after maternal near miss.

Figure 2: Study quality of cohort studies in the review of quality of life after maternal near miss. In the figure illustration of the Newcastle–Ottawa Scale (NOS), the studies which reached a star in each category of the NOS was rewarded a ‘yes’.

Figure 3: Forest plot.

Supporting Information legends

Appendix S1. Search strategies (searched 4 April 2020).

Appendix S2: Quality assessment by use of the Newcastle-Ottawa Scale (NOS).
**Table 1: Description and results of included studies**

<table>
<thead>
<tr>
<th>Year (author)</th>
<th>Country</th>
<th>Type of study</th>
<th>Endpoints (tool)</th>
<th>Total size (exposed/non-exposed)</th>
<th>Age</th>
<th>Time elapsed after near miss</th>
<th>Quality assessment</th>
<th>Association between MNM and QoL (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2020 (Ferreira) (9)</td>
<td>Brazil</td>
<td>Prospective cohort</td>
<td>Quality of life (SF 36*) PTSD* (PTSD-questionnaire) Sexual function (FSFI*)</td>
<td>803 (383/419)</td>
<td>≤19- ≥40</td>
<td>1 yr- 5 yrs</td>
<td>Poor</td>
<td>Mental health: no difference between MNM and no MNM (22.7 % vs 16.8%, p-value 0.08) Sexual dysfunction: no difference in pelvic pain 6 months or more after (17.0 % vs 12.3 %, p-value 0.117)</td>
</tr>
<tr>
<td>2019 (Wall-Wie]er) (21)</td>
<td>Sweden</td>
<td>Population-based matched cohort</td>
<td>Postpartum psychiatric treatments / psychotropic prescription</td>
<td>25674 (8558/17116)</td>
<td>&lt;25- ≥35</td>
<td>1 yr</td>
<td>Good</td>
<td>MNM compared to no MNM OR psy treat: 1.22 (1.03–1.45) OR psy med: 1.44 (1.24–1.58) Different obstetric conditions effect on QoL in MNM OR shock + psychiatric treatment: 28.53 (3.76-215.46) OR shock + psychotropic prescription: 3.03 (1.38-6.64) OR uterine rupture + psychiatric treatment: 2.85 (1.62-5.02) OR uterine rupture + psychotropic prescription: 1.94 (1.28-2.94) OR blood transfusion + psychiatric treatment: 1.07 (0.87-1.31) OR blood transfusion + psychotropic prescription: 1.27 (1.11-1.46) OR cardiovascualr disease + psychiatric treatment: 0.67 (0.07-6.41) OR cardiovascualr disease + psychotropic prescription: 4.32 (1.35-13.81) OR cardiovascualr disease + psychiatric treatment: 2.21 (0.92-5.31) OR cardiovascualr disease + psychotropic prescription: 4.00 (1.90-8.41) OR severe pre-eclampsia/eclampsia + psychiatric treatment: 1.43 (0.82-2.48) OR severe pre-eclampsia/eclampsia + psychotropic prescription: 1.47 (0.98-2.19) OR sepsis + psychiatric treatment: -Model did not converge OR sepsis + psychotropic prescription: 6.61 (0.72-60.86)</td>
</tr>
</tbody>
</table>
Table 1: Description and results of included studies

<table>
<thead>
<tr>
<th>Year (author)</th>
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<th>Quality assessment</th>
<th>Association between MNM and QoL (95% CI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2019 (Pereira) (20)</td>
<td>Brazil</td>
<td>Retrospective cohort</td>
<td>Drug use (ASSIST*)</td>
<td>638 (315/323)</td>
<td>≤19- ≥35</td>
<td>36 mos</td>
<td>Fair</td>
<td>Drug use: no significant differences in drug use after pregnancy between MNM and no MNM (27.3 % vs 24.5 %, p-value: 0.41)</td>
</tr>
<tr>
<td>2018 (Angelini) (19)</td>
<td>Brazil</td>
<td>Retrospective cohort</td>
<td>Quality of life (SF 36*)</td>
<td>801 (383/418)</td>
<td>≤20- ≥40</td>
<td>5 mos - 5 yrs</td>
<td>Poor</td>
<td>QoL: physical function: 75.1 MNM versus 83 non-MNM, (p-value &lt;0.001) QoL role limiting physical: 75.1 MNM versus 83 non-MNM (p-value &lt;0.001) QoL: general health, mean: 59 MNM versus 67.2 non-MNM (p-value: &lt;0.001)</td>
</tr>
<tr>
<td>2018 (Alluvala) (14)</td>
<td>India</td>
<td>Prospective cohort</td>
<td>Depression (EPDS*) Quality of life (WHOQOL BREF*)</td>
<td>86 (43/43)</td>
<td>MNM (mean): 27.67 No MNM (mean): 27.47</td>
<td>1 yr</td>
<td>Poor</td>
<td>Depression: Suicidal ideations was present in 18.4 % of MNM, and 0 % in no MNM (p-value: 0.001) QoL: Psychological life was better among no MNM vs MNM (mean score 75.5 vs 68.1, p value: 0.04)</td>
</tr>
<tr>
<td>2018 (Soma-Pillay) (15)</td>
<td>South Africa</td>
<td>Prospective cohort</td>
<td>Quality of Life (WHOQOL-BREF*)</td>
<td>146 (95/51)</td>
<td>MNM: 28.3 ± 6.83 No MNM: 27.4 ± 7.14</td>
<td>1 yr</td>
<td>Poor</td>
<td>QoL: Overall QoL lower in MNM (mean 3.56 ± 0.9 SD), than in no MNM (mean 4.47 ± 0.6 SD), p-value &lt; 0.001 Psychological health and well-being: lower in MNM (mean 21.9 ± 3.6 SD) than in no MNM (mean 26.0 ±2.7 SD) p-value &lt; 0.001 Social relations: lower value in MNM (11.0 ± 2.3 SD) than no MNM (12.7 ± 1.9 SD)</td>
</tr>
<tr>
<td>2017 (Angelini) (18)</td>
<td>Brazil</td>
<td>Retrospective cohort</td>
<td>PTSD * (PTSD Checklist)</td>
<td>790 (381/409)</td>
<td>≤20- ≥40</td>
<td>5 mos - 5 yrs</td>
<td>Poor</td>
<td>OR PTSD non-MNM: 1.094 (0.766 - 1.564)</td>
</tr>
</tbody>
</table>

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Table 1: Description and results of included studies

<table>
<thead>
<tr>
<th>Year (author)</th>
<th>Country</th>
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<th>Endpoints (tool)</th>
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<th>Association between MNM and QoL (95% CI)</th>
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<tbody>
<tr>
<td>2015 (Assarag) (16)</td>
<td>Morocco</td>
<td>Prospective cohort</td>
<td>Depression (EPDS*) Dyspareunia (interview)</td>
<td>245 (76/169)</td>
<td>28 (mean)</td>
<td>8 mos</td>
<td>Good</td>
<td>Depression aORMNM + live birth: 4.08 (1.85-8.99)</td>
</tr>
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<td></td>
<td>aOR MNM + perinatal death: 4.7 (1.79-12.54)</td>
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<td></td>
<td></td>
<td>Dyspareunia OR dyspareunia: 1.87 (0.17-21.05)</td>
</tr>
</tbody>
</table>
| 2015 (Filippi) (17) | Burkina Faso  | Prospective cohort | Forced to sexual relations Costs (unpaid hospital debts) Depression (K10*) | 950 (273/677)                   | 25.6 (mean) | 3-4 yrs                     | Poor              | 3 mos:  
|              |               |               |                                                      |                                  |     |                              |                   | OR elevated K10: 1.84 (0.98-3.43)  
|              |               |               |                                                      |                                  |     |                              |                   | OR suicidal thoughts: 1.63 (0.73-3.68)  
|              |               |               |                                                      |                                  |     |                              |                   | OR unpaid hospital debt: 4.82 (1.73-13.41)  
|              |               |               |                                                      |                                  |     |                              |                   | 6 mos:  
|              |               |               |                                                      |                                  |     |                              |                   | OR elevated K10: 1.01 (0.41-2.50)  
|              |               |               |                                                      |                                  |     |                              |                   | OR suicidal thoughts: 1.33 (0.44-4.01)  
|              |               |               |                                                      |                                  |     |                              |                   | OR unpaid hospital debt: 7.03 (2.50-19.79)  
|              |               |               |                                                      |                                  |     |                              |                   | 1 yr:  
|              |               |               |                                                      |                                  |     |                              |                   | OR elevated K10: 0.89 (0.34-2.36)  
|              |               |               |                                                      |                                  |     |                              |                   | OR suicidal thoughts: 2.44 (1.14-5.20)  
|              |               |               |                                                      |                                  |     |                              |                   | OR forced to sexual relations: 1.11 (0.24-5.06)  
|              |               |               |                                                      |                                  |     |                              |                   | OR unpaid hospital debt: 4.13 (1.86-9.17)  
|              |               |               |                                                      |                                  |     |                              |                   | 3 yrs  
|              |               |               |                                                      |                                  |     |                              |                   | OR elevated K10: 1.57 (0.62-3.95)  
|              |               |               |                                                      |                                  |     |                              |                   | OR suicidal thoughts: 2.19 (0.77-6.23)  
|              |               |               |                                                      |                                  |     |                              |                   | OR forced to sexual relations: 0.78 (0.10-6.35)  
|              |               |               |                                                      |                                  |     |                              |                   | OR unpaid hospital debt: 3.91 (1.46-10.48)  

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| 2015 (Andreucci) (13) | Brazil | Retrospective cohort | Sexual function (FSFI*) | 638 (315/323) | ≤19- ≥40 | 6 mos - 5 yrs | Poor | Mean difference in duration of days before resuming sexual activity, MNM vs no MNM:
Live child + perinatal death: 18.3 days (p-value: 0.011)
Live child: 20 (p-value: 0.019)
Perinatal death: 28.6 (p-value:0.437)
Mean difference in total FSFI-score, MNM vs no MNM:
Live child + perinatal death: -0.03 (p-value: 0.937)
Live child: 0.3 (p-value: 0.695)
Perinatal death: -5.9 (p-value: 0.583) |
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<tr>
<td>2013 (Ilboudo) (10)</td>
<td>Burkina Faso</td>
<td>Prospective cohort</td>
<td>Quality of Life (WHOQOL-BREF©) Costs (Maxwell food insecurity grid)</td>
<td>638 (219/419)</td>
<td>26 (mean)</td>
<td>4 - 5 yrs</td>
<td>Poor</td>
<td>QoL: MNM had lower QoL than no MNM (Coeff -0.154, p-value 0.003) Costs: MNM paid more than twice the amount for delivery costs than no MNM did. MNM had less rice consumption per week than no MNM (Coeff: -0.362, p-value 0.048). No difference in total consumption of relatively expensive food per week (Coeff: -0.939, p-value: 0.083) MNM spend less money on school-age children than no MNM (Coeff: -1.6e+04, p-value 0.001).</td>
</tr>
<tr>
<td>2010 (Fottrell) (22)</td>
<td>Benin</td>
<td>Prospective cohort</td>
<td>Mental health (K10*) Costs (unpaid hospital debts)</td>
<td>640 (206/434)</td>
<td>27 (mean)</td>
<td>1 yr</td>
<td>Good</td>
<td>K10-mean score (p-value: 0.003): No MNM: 4.15 MNM live baby: 4.37 MNM perinatal death: 6.86 Unpaid hospital debts (p-value &lt; 0.001): No MNM: 1.73 % MNM live baby: 17.69 % MNM perinatal death: 21.74 %</td>
</tr>
<tr>
<td>2010 (Filippi) (23)</td>
<td>Benin</td>
<td>Prospective cohort</td>
<td>Mental health (K10*) Social health interview Sexual dysfunction</td>
<td>645 (205/440)</td>
<td>MNM (mean): 25.8</td>
<td>1 yr</td>
<td>Poor</td>
<td>Mental health: aOR live birth + depression: 1.04 (0.51-2.13) aOR perinatal death + depression: 3.42 (1.30-9.01)</td>
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| 2010          | Burkina Faso   | Prospective cohort| Sexual dysfunction (interview)    | 1011 (336/675)                      | MNM (mean): 25.3                      | 6 mos          | Good | aOR live birth + suicidal thoughts: 0.64 (0.28-1.48)  
aOR perinatal death + suicidal thoughts: 1.44 (0.51-3.88)  
Social health:  
aOR live birth + pregnancy negative effect on woman’s life: 1.70 (0.99-2.94)  
aOR perinatal death + pregnancy negative effect on woman’s life: 4.11 (1.87-9.00)  
aOR live birth + pregnancy made her feel blamed by someone close to her: 0.83 (0.27-2.53)  
aOR perinatal death + pregnancy made her feel blamed by someone close to her: 9.03 (2.09-39.03)  
Sexual dysfunction:  
aOR live birth + dyspareunia: 1.05 (0.54-2.06)  
aOR perinatal death + dyspareunia: 1.45 (0.59-3.59)  |
| 2008          | Burkina Faso   | Prospective cohort| Costs (hospital records, interview) | 1014 (337/677)                      | 26 (mean) | 1 yr              | Poor | Costs:  
Health costs are higher for MNM (mean 10,892 francs vs 4531 francs, p-value 0.002)  
Insufficiency of food happens more often up till 6 months after MNM (15.7 % vs 9.7 %, p-value 0.009)  
MNM have to spend savings (32.1 % vs 12.6 %), borrow |
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<td>money for hospital cost (30.5% vs 7.9%) and sell assets (11.2% vs 2.5%) more often than no MNM (p-value &lt; 0.001)</td>
</tr>
</tbody>
</table>

SF 36: Short Form Health Survey, PTSD: Post-traumatic stress disorder, FSFI: Female Sexual Functioning Index, ASSIST: Alcohol, Smoking and Substance Involvement Screening Test, EPDS: Edinburgh postnatal depression score, WHOQOL-BREF: World Health Organization Quality of Life Scale, abbreviated, K10: Kessler Psychological Distress Scale
Figure 1: Flow chart of study selection in the review of quality of life after maternal near miss
<table>
<thead>
<tr>
<th>Category</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Representativeness of the cohort</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Selection of the Non-Exposed Cohort</td>
<td>13</td>
<td>2</td>
</tr>
<tr>
<td>Ascertainment of Exposure</td>
<td>12</td>
<td>3</td>
</tr>
<tr>
<td>Demonstration That Outcome of Interest Was Not Present at Start of Study</td>
<td>1</td>
<td>14</td>
</tr>
<tr>
<td>Comparability of Cohorts on the Basis of the Design or Analysis</td>
<td>8</td>
<td>7</td>
</tr>
<tr>
<td>Assessment of Outcome</td>
<td>10</td>
<td>5</td>
</tr>
<tr>
<td>Was Follow-Up Long Sufficient for Outcomes to Occur</td>
<td>15</td>
<td>0</td>
</tr>
<tr>
<td>Adequacy of Follow Up of Cohorts</td>
<td>8</td>
<td>7</td>
</tr>
</tbody>
</table>

Figure 2: Study quality of cohort studies in the review of quality of life after maternal near miss. In the figure illustration of the Newcastle–Ottawa Scale (NOS), the studies which reached a star in each category of the NOS was rewarded a ‘yes’
Figure 3: Forest plot