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Review article

Maternal childhood maltreatment and perinatal outcomes: A systematic review

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ABSTRACT

Background: Maternal childhood maltreatment (MCM) is linked to poor perinatal outcomes but the evidence base lacks cohesion. We explore the impact of MCM on four perinatal outcome domains: pregnancy and obstetric; maternal mental health; infant; and the quality of the care-giving environment. Mechanisms identified in the included studies are discussed in relation to the maternal programming hypothesis and directions for future research.

Method: We completed a comprehensive literature search of eight electronic databases. Independent quality assessments were conducted and PRISMA protocols applied to data extraction.

Results: Inclusion criteria was met by $N = 49$ studies. MCM was consistently associated with difficulties in maternal and infant emotional regulation and with disturbances in the mother-infant relationship. Directly observed and maternal-reported difficulties in the mother-infant relationship were often mediated by mothers' current symptoms of psychopathology. Direct and mediated associations between MCM and adverse pregnancy and obstetric outcomes were suggested by a limited number of studies. Emotional and sexual abuse were the most consistent MCM subtype significantly associated with adverse perinatal outcomes.

Limitations: A meta-analysis was not possible due to inconsistent reporting and the generally small number of studies for most perinatal outcomes.

Conclusions: MCM is associated with adverse perinatal outcomes for mothers' and infants. Evidence suggests these associations are mediated by disruptions to maternal emotional functioning. Future research should explore biological and psychosocial mechanisms underpinning observed associations between specific subtypes of MCM and adverse perinatal outcomes. Services have a unique opportunity to screen for MCM and detect women and infants at risk of adverse outcomes during the perinatal period.

Childhood maltreatment is defined as the abuse and neglect that occurs to children under 18 years of age. It includes all types of physical and/or emotional ill-treatment, sexual abuse, neglect, negligence and commercial or other exploitation. The maltreatment must result in actual or potential harm to the child's health, survival, development, or dignity in the context of a relationship of responsibility, trust, or power (World Health Organisation, 2016). The lasting effects of childhood maltreatment are a major public health issue. Childhood maltreatment may result in negative, lifelong consequences for an individual including a weaker stress response system (Zhai et al., 2019), elevated risk of obesity (Danese and Tan, 2014), an elevated risk of suicide (Raleva, 2018), and an increased likelihood of income inequality (Eckenrode et al., 2014). The lifetime societal cost per child exposed to maltreatment in the UK is just under £90,000 (Conti et al., 2017). With an estimated 1 in 5 children experiencing some form of maltreatment (Radford et al., 2011), the risk of societal and economic costs is enormous. It is therefore important to identify time points during the life course when the effects of childhood maltreatment are most prominent and intervention efforts potentially most fruitful.

One such time point is the perinatal period. The perinatal period, defined as from when pregnancy begins to one year after childbirth (McKenzie-McHarg et al., 2015), is a time of heightened stress for women (Mulder et al., 2002). In addition to everyday life stressors, pregnant women are exposed to additional challenges brought about by

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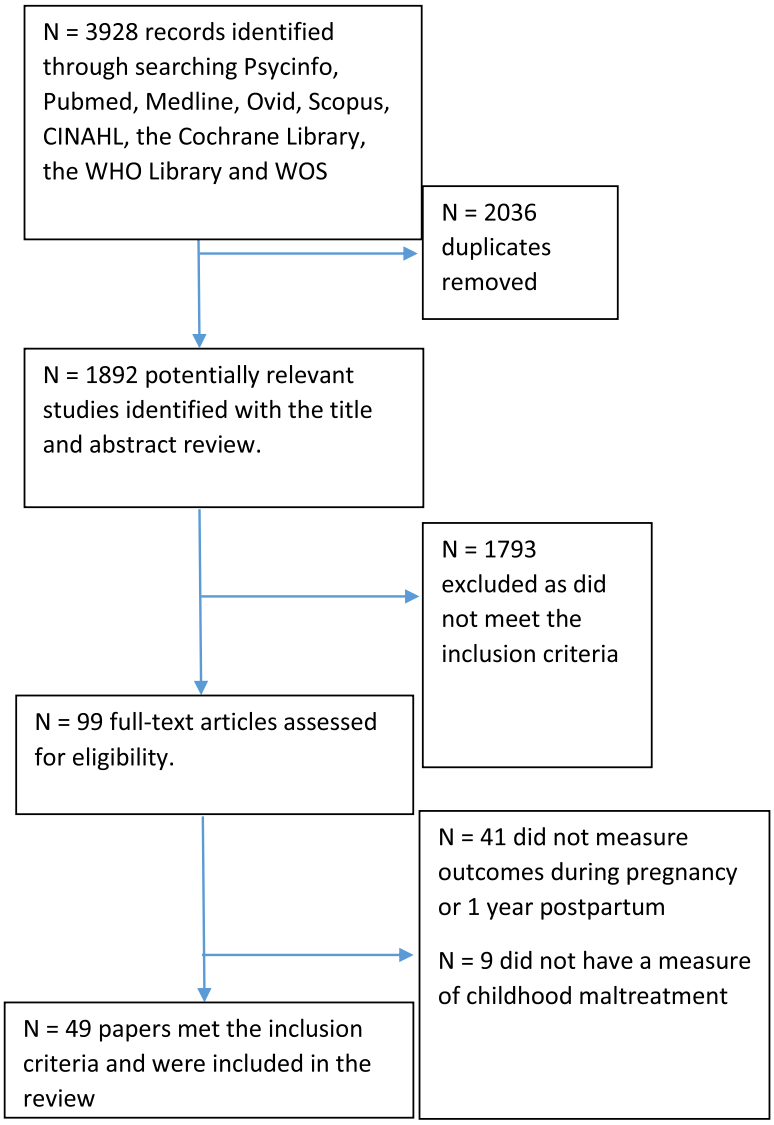

Fig. 1. PRISMA protocols of data extraction.

changes in body shape, hormonal changes, and pregnancy specific anxiety and procedures, such as worries about foetal development, childbirth related fears, or physical examinations that could trigger trauma memories (Adams et al., 2012; Frazier et al., 2018; Stevens et al., 2017). In line with the diathesis-stress model, the perinatal period is a time during which negative effects of childhood maltreatment can manifest, as women exposed to childhood maltreatment are associated with increased vulnerability to the challenges of pregnancy and raising a young infant (Finy and Christian, 2018; Shapero et al., 2014). The presence of a history of maternal childhood maltreatment (MCM) not only holds potential negative implications for the mother during the perinatal period, but also for her offspring. From conception to an infant's second birthday, an infant is shaped by their environment, their interaction with their parents, and their own personal growth (Durkan et al., 2015). Exposure to maternal psychopathology and poorer parenting practices during the perinatal period have been shown to adversely affect offspring cognitive, behavioural, and emotional development (Dean et al., 2018; Rees et al., 2019; Stein et al., 2014; Waters et al., 2014), increasing the risk of offspring psychiatric disorder in adolescence and early adulthood (Naughton et al., 2018; Pawlby et al., 2009; Plant et al., 2018). It is likely that there are potential intergenerational implications of MCM that can begin during the perinatal period.

A history of MCM can influence the physical outcomes of pregnancy and childbirth. Prolonged childhood maltreatment has been directly linked to neuroendocrine alterations, such as cortisol and oxytocin dysregulation (Bublitz and Stroud, 2012; Carpenter et al., 2007; De Bellis and Zisk, 2014) which can lead to birth complications such as preterm delivery (Buss et al., 2009), and low birth weight (Baibazarova et al., 2013; Diego et al., 2006). In addition, a history of childhood maltreatment is strongly linked with developing depression (Khan et al., 2015), and maternal depression is associated in some studies with an increased risk of delivery complications, including preterm delivery, low birth weight, and reduced foetal growth through environmental and genetics pathways (Lev-Wiesel et al., 2009; Morland et al., 2007; Zhang et al., 2018), and infant developmental problems (Choi et al., 2019; Clark et al., 2018; Kim-Cohen et al., 2005). Further to an indirect association between MCM and perinatal depression, direct associations have also been demonstrated (Pawlby et al., 2011; Plant et al., 2013), with offspring emotional difficulties persisting into young adulthood following exposure to maternal depression during gestation (Plant et al., 2017, 2018). In addition to environmental and childrearing factors that can influence the documented intergenerational implications, genetic factors may also underlie associations between MCM and adverse parent and child outcomes (Mistry et al., 2018; Wichers et al., 2007).

Perinatal mental health problems carry a total economic and social

Table 1
Methodological characteristics of included studies.

Study (first author and year)	Location	Design	Sample	Participants	Mean Maternal Age	MCM exposure rates	MCM Measures	Perinatal outcomes measures	Quality ratings (/9)
Pregnancy and Obstetric Outcomes									
Abajobir, 2018	Australia	Prospective	Clinical	3081 pregnant women (PW)	20.6	153 (5%)	Reports from the QGDFYCC	**Number of Miscarriages:** Determined by interview; **Emotion regulation:** CBCL	7
Altemeier, 1986	USA	Prospective	Community	927 mother-infant dyads (MID)	20.5	95 (10%)	Interview	**Birth weight, Gestation, and Preterm birth:** medical records; **Early infant outcomes:** APGAR and BNBASS; **Child abuse potential:** Interview and social service records	9
Benedict, 1999	USA	Prospective	Clinical	357 PW	20–24 mode	133 (37%)	LEQ	**Birth weight and Gestation:** Medical records**; Early infant outcomes:** APGAR	7
Bowman, 2009	USA	Cross-Sectional	Community + Clinical	78 MID	15–19	24 (31%)	CTQ	**Breastfeeding:** Interview	5
Bublitz, 2020	USA	Cross-Sectional	Clinical	127 PW	30.5	35 (28%)	ACEs	**Blood pressure:** ScottCare blood pressure monitoring device; **Pregnancy complications:** Medical records	7
Christiaens, 2015	Canada	Cross-Sectional	Community	622 MID	29.16	210 (34%)	ACEs	**Preterm birth:** Medical records/Well-being and pregnancy questionnaire	5
Leeners, 2014	Germany	Cross-sectional	Community + Clinical	255 PW	27	85 (33%)	Interview, including yes/no for physical and emotional abuse	**Preterm delivery:** Medical data on delivery outcomes	5
Ozsahin, 2020	Turkey	Cross-Sectional	Community	536 PW	27.95	50 (9%)	ACEs	**Acceptance of motherhood:** Subscale of the PSEQ; **Parental anxiety:** PRAQ-R2	7
Stevens, 2017	USA	Cross-Sectional	Clinical	41 PW	27.85	27 (66%)	CTQ and THQ	**Maternal communication competency:** Self-designed questionnaire constructed using 7 items from Bandura's self-efficacy scale guidelines	6
Stevens-Simon, 1994	USA	Prospective	Community	127 PW	12–30	42 (33%)	Interview	**Birth weight and Gestation:** Medical records	9
Talmon, 2018	Israel	Cross-Sectional	Community	470 PW	30.67	201 (43%)	CTQ	**Self-objectification:** SOS**; Disrupted body boundaries:** SBBS**; Shame:** ESS	5
Infant Outcomes									
Agrati, 2015	Canada	Prospective	Community	159 MID	20.5	95 (10%)	CTQ	**Infant emotion regulation:** Lab based observations + IBQ + ECBQ	7

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Table 1 (*continued*)

Altemeier, 1986	Reported previously								
Benedict, 1999	Reported previously								
Choi, 2017	South Africa	Prospective	Community	150 MID	25	86 (57%)	CTQ	**Mother-infant bonding:** PBQ; **Maternal Depression:** EPDS	6
Lang, 2010	USA	Prospective	Community	44 MID	29.27	Not specified	CTQ	**Mother-infant bonding:** PSI-SF; **Maternal depression:** BDI-II	6
McDonnell, 2016	USA	Prospective	Community	398 MID	24.76	192 (48%)	FHHQ	**Infant socioemotional development:** ASQ	6
Moog, 2018	USA	Prospective	Clinical	80 MID	28.06	28 (35%)	CTQ	**Infant brain development:** MRI	8
Quality of the Care-Giving Environment Outcomes									
Altemeier, 1986	Reported previously								
Bert, 2009	USA	Cross-Sectional	Community	681 MID	19.8	375 (55%)	CTQ	**Child abuse potential:** CAPI	5
Choi, 2017	As above								
Fava, 2016	USA	Cross-Sectional	Community + Clinical	268 MID	29.5	170 (63%)	CTQ	**Parenting attitudes:** TMMI	6
Fuchs, 2015	Germany	Prospective	Community	119 MID	32.44	58 (49%)	CTQ	**Emotional availability:** EAS	8
Guyon-Harris, 2020	USA	Prospective	Community	120 PW	26.21	77 (64%)	CTQ	**Parenting behaviour:** AMBIANCE	6
Juul, 2016	USA	Cross-Sectional	Clinical	255 MID	34	40 (16%)	SCID	**Affect:** Maternal affect during interaction	9
Lang, 2010	Reported previously								
Leeners, 2014	Reported previously								
MacMillan, 2020	Australia	Prospective	Clinical	211 PW	31.5	42 (20%)	CTQ	**Emotional Availability:** EAS; **Childbirth Experience:** CEQ; **Stressful Life Events:** SLE	8
Martinez-Torteya, 2014	USA	Prospective	Community + Clinical	153 MID	29.06	101 (66%)	CTQ	**Mother-infant interpersonal relationship:** SFP (MACY Infant–Parent Coding System); **Maternal depression:** PPDS	8
Moehler, 2007	Germany	Cross-Sectional	Community	119 MID	Not specified	58 (49%)	CTQ	**Emotional Availability:** EA Scales and Interaction observations	5
Moehler, 2009	Germany	Cross-Sectional	Community	119 MID	Not specified	58 (49%)	CTQ	**Maternal impulsiveness:** BIS	5
Morelen, 2016	USA	Prospective	Community	192 MID	28.88	137 (71%)	CTQ	**Maternal affect:** Observed Maternal and Infant Affective Displays (MACY I-PCS)	7
Muzik, 2013	USA	Prospective	Community	150 MID	29	97 (65%)	CTQ	**Mother-infant bonding:** PBQ and interactions (MACY I-PCS); **Maternal psychopathology:** PPDS and NWS	8
Muzik, 2017	USA	Cross-Sectional	Community + Clinical	164 MID	29.18	102 (62%)	CTQ	**Maternal depression:** PPDS; **Maternal PTSD:** NWS-PTSD; **Self-reported parenting:** PBQ; **Observed**	8

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Table 1 (*continued*)

								parenting: Observed free play and teaching tasks (MACY I-PCS);	
Seng, 2013	USA	Prospective	Community	556 MID	27.0	110 (20%)	LSC	**Maternal mental health:** PPDS, NWS; **Mother-infant Bonding:** PBQ	6
Sexton, 2015	USA	Cross-Sectional	Community + Clinical	214 MID	28.8	145 (68%)	CTQ	**Parenting competence:** PSOC	7
Stacks, 2014	USA	Prospective	Community + Clinical	83 MID	30.04	58 (70%)	CTQ and NWS	**Mother-infant interaction:** MACY IPCS; **Maternal reflective functioning:** PDI-SF; **Infant attachment security:** SSP	7
Maternal Mental Health Outcomes									
Barrios, 2015	Peru	Cross-Sectional	Community	1521 PW	28.0	1056 (69%)	CPSAQ	**Maternal depression:** PHQ-9	5
Benedict, 1999	Reported previously								
De Venter, 2016	Belgium	Prospective	Community	183 MID	30.0	45 (25%)	TEC	**Maternal depression:** EPDS, MDQ, DASS	7
England-Mason, 2017	Canada	Prospective	Community	140 MID	32.3	58 (41%)	CTQ	**Maternal emotion regulation:** ERQ, DERS, and Emotional Stroop; **Maternal cortisol reactivity:** Salivary cortisol	8
England-Mason, 2018	Canada	Prospective	Community	140 MID	32.3	58 (41%)	CTQ	**Maternal emotion regulation:** ERQ, DERS, and Emotional Stroop	6
Lara 2015	Mexico	Cross-Sectional	Community	357 PW	27.05	117 (33%)	CECAQ	**Maternal depression:** BDI-II + SCID	4
Leeners, 2014	Reported previously								
Levey, 2018	Peru	Cross-Sectional	Community	2062 PW	27.8	992 (48%)	SQCT	**Maternal suicidal ideation:** SQ	4
Marysko, 2010	Germany	Prospective	Community	119 MID	Not specified	58 (49%)	CTQ	**Maternal dissociative experiences:** SDE-E	5
Nagl, 2017	Germany	Cross-Sectional	Community	741 MID	30.58	361 (49%)	CTQ	**Maternal depression:** BDI-II; **Maternal obesity:** Self-reported BMI	6
Nidey, 2020	USA	Cross-Sectional	Community	419 MID	20	173 (41%)	ACEs	**Maternal depression:** EPDS	7
Seng, 2013	Reported previously								
Zhang, 2020	China	Cross-Sectional	Clinical	1825 PW	31.14	154 (8%)	CTQ	**Suicide ideation and depression:** PHQ-9	6
Mediators of Associations Between MCM Exposure and Adverse Perinatal Outcomes									
Abajobir, 2018	Reported previously								
Agrati, 2015	Reported previously								
Benedict, 1999	Reported previously								
Brand, 2010	USA	Cross-Sectional	Clinical	126 MID	34	38 (30%)	CTQ	**Maternal + Infant cortisol levels:** Saliva; **Postpartum stressor:** PERI-SLES; **Maternal**	8

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Table 1 (*continued*)

								PTSD: SCID; **Maternal depression:** BDI-II	
Bublitz, 2020	Reported previously								
Choi, 2017	Reported previously								
De Venter, 2016	Reported previously								
England-Mason, 2017	Reported previously								
Finy, 2018	USA	Cross-Sectional	Community	214 PW	29.38	Not specified	CTQ	**Inflammation:** Serum levels of C-reactive protein	6
Juul, 2016	Reported previously								
Koenig, 2018	Germany	Cross-Sectional	Community	150 MID	32.6	76 (51%)	CTQ	**Mother and infant neurotransmitter samples:** Hair	7
Lang, 2010	Reported previously								
McDonnell, 2016	Reported previously								
Moog, 2016	USA	Prospective	Community	295 PW	28.92	126 (43%)	CTQ	**Placental CRH:** Maternal blood	8
Moog, 2017	USA	Prospective	Community	102 PW	27.9	29 (28%)	CTQ	**Maternal thyroid function:** Fasting maternal venous blood samples	8
Morelen, 2016	Reported previously								
Muzik, 2013	Reported previously								
Muzik, 2017	Reported previously								
Nagl, 2017	Reported previously								
Oosterman, 2018	Netherlands	Prospective	Clinical	193 PW	23.97	158 (82%)	ACEs	**Maternal depression:** BDI-II; **Maternal RSA reactivity:** ECGs; **Maternal parenting anxiety:** State Trait Anxiety Inventory	6
Plaza, 2012	Spain	Cross-Sectional	Community	303 MID	32.6	29 (10%)	ETI-SR	**Maternal depression:** EPDS; **Maternal thyroid function:** Blood sample	6
Schreier, 2015	USA	Prospective	Community	180 PW	26.9	27 (15%)	CTQ	**Maternal cortisol levels:** Hair samples	7
Seng, 2013	Reported previously								
Talmon, 2018	Reported previously								

ACEs - Adverse Childhood Experiences Checklist; **AMBIANCE** – Disrupted Maternal Behaviour Instrument for Assessment and Classification; **ASQ** - Ages and stages questionnaire; **BDI-II -** Beck Depression inventory-II; **BIS -** Barrat's Impulsiveness Scale; **BNBASS** - Brazelton Neonatal Behavioural Assessment Scale scores; **CAPI -** Child Abuse Potential Inventory; **CBCL -** Child behavior Checklist; **CECAQ** - Childhood Experience of Care and Abuse Questionnaire; **CEQ** – Childbirth Experience Questionnaire; CPSAQ - Childhood Physical and Sexual Abuse Questionnaire; **DASS** - Depression Anxiety and Stress Scales; **DERS** - Difficulties in Emotion + Regulation Scale; **EAS -** Emotional availability scale; **ECBQ** - Early Childhood Behaviour Questionnaire; **EPDS -** Edinburgh Postnatal Depression Scale; **ERQ -** Emotion Regulation Questionnaire; **ESS -** Experience of Shame Scale; **ETI-SR** - Early Trauma Inventory Self-Report; **FHHQ** - Family health history questionnaire; **IBQ** - Infant Behaviour Questionnaire; **LEQ -** Life Events Questionnaire; **LSC -** Life stressor checklist; **MDQ** - Major Depression Questionnaire; **NWS** - National Women's Survey; **PBQ -** Postpartum Bonding Questionnaire; **PDI-SF -** Parent Development Interview-SF; **PERI-SLES -** Psychiatric Epidemiology Research Interview Stressful Life Events Scale; **PHQ-9 -** Patient Health Questionnaire-9; **PPDS -** Postpartum Depression Screening Scale; **PRAQ-R2 –** Pregnancy-Related Anxiety Questionnaire-Revised 2; **PSEQ –** Prenatal Self Evaluation Questionnaire; **PSI-SF -** Parenting Stress Index-Short Form, Infant Behaviour Questionnaire-Revised; **PSOC** – Parenting sense of competence; **QGDFYCC** - Queensland Government Department of Families, Youth, and Community Care; **SBBS -** Sense of Body Boundaries Survey' **SCID** - Structured Clinical Interview for DSM-IV; **SDE-E -** Scale of Dissociative Experiences for adults; **SFP -** Still face paradigm; **SLE** – Stressful Life Events Questionnaire; **SOS -** Self-Objectification Scale; **SQ** - Suicide Questionnaire; **SQCT** - Structured questionnaire of childhood trauma; **SSIQ** - Social Stress Indicator Questionnaire; **SSP -** Strange situation paradigm; **TEC -** Traumatic Experiences Checklist; **THQ** - Trauma History Questionnaire; **TMMI -** Trauma-Meaning Making Interview; **VAS -** Visual analogue scale.

Table 2
Study analyses, results, and limitations.

Study (first author and year)	Covariates	Primary Results	Mediators of associations	Effect of MCM sub-type	Effect size as Cohen's d*	Main Limitations
Pregnancy and Obstetric Outcomes						
Abajobir, 2018	Number of pregnancies; Gestation; Sex of infant; Internalizing of problems; Marital status; Alcohol; Tobacco	Risk of miscarriage was associated with MCM	Pre-pregnancy symptoms of emotional dysregulation mediated observed associations	Emotional abuse showed the strongest association with the risk of miscarriage	MCM and miscarriage = 0.205 Emotional abuse and miscarriage = 0.556	Genetic contributions not considered; The study was unable to separate MCM history from current risky behaviour; Smoking and alcohol at conception (rather than during pregnancy) was not accounted for; High dropout rates in those with MCM leading to underestimations; Duration and extent of MCM was not analysed
Altemeier, 1986	Stress; Honesty; Self-esteem	Indirect association of MCM on birth weight; No association of MCM on neonatal outcomes; MCM increased levels of anger and physical discipline towards infants	Self-esteem mediated the associations of MCM on birth weight. Other results remained after statistical control for covariates.	Differential associations by MCM subtype not investigated	N/A	The use of a non-structured interview for assessing MCM may lead to differing aspects of MCM captured between participants.
Benedict, 1999	Prenatal depression; Life stresses	No association of MCM on birth weight or 5-minute AGPAR score. MCM associated with an increased risk of prenatal depression	N/A	Sexual abuse most likely to increase prenatal depression	Sexual abuse and prenatal depression = 0.490	Measures used may skew rates of depression to more frequent due to the pregnant and low SES population used.
Bowman, 2009	Anxiety for intimate parenting behaviours, (e.g., hugging)	No association of MCM and parenting anxiety	Attendance of parenting classes may have reduced the association if dissociation and anxiety that arose from MCM	No associations of sub-type	MCM and parenting anxiety = 0.230	Some participants knew each other which may lead to socially desirable responses to measures despite anonymity and confidentiality.
Bublitz, 2020	Prenatal stress	MCM associated with an increase in maternal blood pressure, increasing the risk of preterm delivery, pre-eclampsia, and foetal organ damage	N/A	Differential associations by MCM subtype not investigated	MCM and maternal blood pressure = 0.760	Sub-type of MCM was not separated out
Christiaens, 2015	Substance use; Education; Socio-economic status; Marital status; Income; Ethnicity; Miscarriages in previous pregnancies	MCM associated with an increased risk of preterm delivery	N/A	Physical and emotional abuse combined, but not separately, associated with these findings	MCM and preterm delivery = 0.406	Potential recall bias; Upsetting questions for mothers early in the postpartum period.
Leeners, 2014	Pregnancy related diseases; Depression; Alcohol; Partner smoking	MCM associated with an increased risk of preterm delivery; MCM associated with an increase in risky pregnancy behaviours such as smoking; MCM associated with increased suicidal ideation in pregnancy	N/A	Sexual abuse showed the greatest associations for all outcomes.	MCM and preterm delivery = 0.457 Sexual abuse and smoking in pregnancy = 0.101 MCM and suicidal ideation = 0.101	Self-developed measure used lacking validation
Ozsahin, 2020	Age; Marital status; Education; Living place; employment; Social security; Economic status; Family type; # of pregnancies	MCM associated with increased anxiety towards parenting as well as less acceptance of the role of motherhood	N/A	Differential associations by MCM subtype not investigated	N/A	Sub-type of MCM was not explored; Most women were measured in the 3rd trimester potentially affecting the ability to generalise findings
Stevens, 2017	PTSD; Depression; Pregnancy-related anxiety; Ethnicity; Age; Education; Employment status; Household income	MCM associated with a lack of sufficient confidence to ask for medical advice, and lower self-efficacy in	N/A	Differential associations by MCM subtype not investigated	N/A	Sample was from women receiving interventions on coping and communication so may be a subset of women who differ from the general

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Table 2 (*continued*)

		communicating obstetric care preference				pregnant population; Lack of control group
Stevens-Simon, 1994	Age at conception; BMI at conception; Weight gain; Health habits; Social history; Medical and obstetric complications	MCM associated with gestation but was not associated with lower birth weights	N/A	Differential associations by MCM subtype not investigated	MCM and gestation = 0.261	The mechanisms linking antecedent abuse with adverse pregnancy outcomes not controlled for
Talmon, 2018	Age; Education; Income; No. of children; Fertility treatment; Pregnancy status; Gestation	Indirect association of MCM and fear of childbirth shown through self-objectification and body shame	N/A	Differential associations by MCM subtype not investigated	MCM and fear of childbirth = 0.440	Only a narrow view of fear of childbirth was captured
Infant Outcomes						
Agrati, 2015	Number of children; sex of infant; Income; Maternal age; Birth weight; Gestational age; Duration of breastfeeding	MCM associated with higher levels of maternal anxiety during pregnancy, which in turn was associated with increased infant negative affectivity in their first year	N/A	Differential associations by MCM subtype not investigated	MCM and infant negative affectivity = 0.339	Possibility of common method variance bias as a consequence of women responding on gestational anxiety and early adversity questionnaires at the same interview; Some concerns surrounding missing data
Altemeier, 1986	Reported previously					
Benedict, 1999	Reported previously					
Choi, 2017	Infant emotional and behaviour development; Infant growth	No direct association of MCM on infant growth; MCM associated with postpartum depressive symptoms directly and indirectly via distress	Mediating association of distress between MCM and postpartum depression; postpartum depression mediated associations of MCM on infant growth	Abuse and neglect subtypes associated with adverse perinatal outcome	N/A	Modest sample size; Missing data; Mother-infant bonding was measured with self-report, potentially leading to socially desirable answers; Food insecurity may have been an unmeasured covariable
Lang, 2010	Ethnicity; Household income; Marital status; Number of children; Education; Physical health	MCM associated with infant's recovery from distress; MCM associated with disrupted mother-infant interactions; MCM associated with lower parental distress but also less confidence in parenting roles	N/A	Clear differing associations of MCM sub-type. Both physical and emotional MCM associated with increased maternal perinatal depression but with differing infant outcomes. Emotional MCM associated with disrupted mother-infant interactions greater than physical MCM	N/A	The contribution of maternal history of childhood neglect was not examined, only abuse; Small sample size
McDonnell, 2016	Maternal age; Ethnicity; Prenatal depression symptoms	MCM associated with higher levels of negative infant affectivity at 6 months postpartum	Direct associations were shown as well as indirectly via perinatal depression as a mediator.	Abuse and neglect show associations, whereas household dysfunction does not	N/A	PTSD symptoms or diagnosis were not considered
Moog, 2018	Depression; Stress; Anxiety; Medication; Violence; Obstetric risk; BMI; SES; Education; Income	MCM associated with smaller offspring brain size and grey matter volume	N/A	Differential associations by MCM subtype not investigated	N/A	A healthy sample was used that was not enriched with MCM exposure
Quality of the Care-Giving Environment Outcomes						
Altemeier, 1986	Reported previously					
Bert, 2009	Parenting knowledge; Parenting style and expectations	MCM associated with increased child abuse potential	N/A	Emotional and physical abuse have the strongest association	Emotional abuse and child abuse potential = 0.303 Physical abuse and child abuse potential = 0.366	Covariates such as race, gender, and culture were not considered
Choi, 2017	Reported previously					
Fava, 2016	Age; Ethnicity; Marital status; Education; Household income	MCM associated with attitudes towards parenting, with sub-type of MCM associated with whether parenting attitudes are positive or negative.	N/A	Parent-perpetrated MCM associated with increased positive parenting attitudes, whilst all other MCM associated with increased negative parenting attitudes	N/A	Self-report of parenting attitudes may lead to social desirability bias
Fuchs, 2015			N/A		N/A	

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Table 2 (*continued*)

	Infant gender; Marital status; Education; Infant siblings	MCM associated with less emotional availability at 12 months (but not 5 months) postpartum		Emotional abuse had the strongest individual association, but cumulative MCM had the greatest association		Self-report measures of emotional availability, rather than clinical interviews, were used
Guyon-Harris, 2020	Race; Ethnicity	MCM associated with more emotional communication errors between mothers and infants	N/A	High sexual, physical, and emotional MCM increased associations.	N/A	Relatively small sample size; Unresolved status with respect to maternal experiences of trauma was not measured
Juul, 2016	Maternal /infant age; Education; Ethnicity; Depression; Infant sex; Caffeine	MCM associated with increased neutral emotional expression of mothers during interactions with offspring	N/A for neutral expression. Smoking statues and infant age mediated associations of MCM on positive expression	Differential associations by MCM subtype not investigated	N/A	Sub-types of MCM not considered; Study should be replicated in a more demographically diverse sample
Lang, 2010	Reported previously					
Leeners, 2014	Reported previously					
MacMillan, 2020	Maternal depression; Age; Parity; Education	MCM associated with poorer maternal emotional availability (EA)	N/A	Differential associations by MCM subtype not investigated	MCM and maternal EA = 0.773	The impact of social support, a protective factor that might reduce the impact of maternal trauma on the mother–infant relationship, not accounted for; Child's perspective of EA not measured
Martinez-Torteya, 2014	Age; Ethnicity; Marital status; Education; SES; Household income; Maternal PTSD symptoms	MCM indirectly associated with increased negative parenting	Depressive symptoms mediate associations of MCM on negative parenting	Differential associations by MCM subtype not investigated	N/A	Cross-sectional nature doesn't allow causal conclusions to be drawn; Genetic contributions not considered
Moehler, 2007	Infant sex/ birthweight; Education; Marital status; No. of children	MCM associated with more intrusive maternal interactions	N/A	Differential associations by MCM subtype not investigated	N/A	Clinical interviews not performed; Maternal self-esteem not captured
Moehler, 2009	Infant gender; Maternal education; Marital status; Number of children; Infant birth weight	MCM associated with increased impulsiveness and risk-taking during pregnancy	N/A	Physical and sexual MCM particularly associated with these outcomes	N/A	Clinical interviews not performed
Morelen, 2016	Age; Education; Marital status; Income; Ethnicity	MCM associated with infants reflecting less negative, and more positive, emotional expression during interactions	N/A for direct effects. Indirect pathways associated with current symptomology.	Differential associations by MCM subtype not investigated	N/A	No psychological assessments conducted
Muzik, 2013	Age; Ethnicity; Household income; Education; Marital status	MCM associated with increased depression and PTSD symptoms; No direct association of MCM on mother-infant relationship quality	Current symptomology associated with relationship quality	Abuse and neglect most associated	N/A	Moderate SES and low demographic risk of participants may mean results are not able to be generalised.
Muzik, 2017	Comorbid mental illness	No direct association of MCM on mother-infant relationship quality	Current symptomology associated with relationship quality	Differential associations by MCM subtype not investigated	N/A	Small, non-demographically diverse sample; No psychiatric measures used
Seng, 2013	Ethnicity; Teen pregnancy; Income; Education; Zip code crime	MCM associated with increased pre-pregnancy depressive symptoms, reducing the quality of mother-infant relationship; No direct association of MCM on postnatal depression	Pre-existing depression mediated the association of MCM on mother-infant relationship quality and on postnatal depression	Differential associations by MCM subtype not investigated	N/A	Trauma-exposed and PTSD-affected women were oversampled potentially leading to an underestimation of pre-existing depression
Sexton, 2015	Cohabitation status; Ethnicity; Employment; Income; Education; Maternal and infant health concerns; Perinatal medication use	No association of MCM on parenting competence	N/A	Differential associations by MCM subtype not investigated	N/A	Abuse and neglect were the only forms of MCM included; Resilience measures were self-report
Stacks, 2014	Age; Education; Income; Ethnicity; Marital status; Infant sex	High reflective functioning associated with improved parenting sensitivity	N/A	Differential associations by MCM subtype not investigated	N/A	Over-selection of MCM and postpartum psychopathology may limit generalisation to more normative samples
Maternal Mental Health Outcomes						

(*continued on next page*)

Table 2 (*continued*)

Barrios, 2015	Age; Ethnicity; Parity; Education; Employment; Food access; Planned pregnancy; Health; Gestation	MCM associated with elevated rates of depression during pregnancy	N/A	MCM subtypes of physical and sexual abuse associated with elevated rates of depression in pregnancy	MCM and prenatal depression = 0.401 Physical abuse and prenatal depression = 0.396 Sexual abuse and prenatal depression = 0.101	A hospital-based sample may limit the application of findings to the general population
Benedict, 1999	Reported previously					
De Venter, 2016	Past depression; Type D personality	No direct association of MCM on post-partum depression	Past depression mediates associations	Differential associations by MCM subtype not investigated	N/A	Covariates such as maternal age, SES, current stressful life events, re-traumatization in adulthood, and partner support were not considered.
England-Mason, 2017	Marital status; Education; Income; Breastfeeding; Medication use; Postpartum mood	MCM associated with increased difficulties with emotion regulation in the postpartum period	Emotional regulation mediated associations of MCM on lower baseline maternal cortisol levels	Differential associations by MCM subtype not investigated	N/A	Recent life stressors not considered; Covariates that affect cortisol reactivity, such as BMI, not fully considered
England-Mason, 2018	Ethnicity; Marital status; Education; Household income	MCM associated with decreased attention bias to emotional stimuli postnatally	N/A	Differential associations by MCM subtype not investigated	N/A	Covariates such as sleep quality not considered; Emotional regulation self-reported potentially leading to social desirability bias
Lara 2015	Age; Education; Income; Partner status; Depression; Anxiety; Social support	MCM associated with increased risk of prenatal depression by 2.6-fold	N/A	Sexual abuse showed the greatest association, followed by verbal abuse.	N/A	A clinical sample used may overestimate the link between MCM and mental health outcomes
Leeners, 2014	Reported previously					
Levey, 2018	Age; Education; Ethnicity; Marital status; Employment; Access to basics; Parity; Planned pregnancy; Early pregnancy BMI; Gestation; History of partner violence	MCM associated with suicidal behaviour in pregnancy	N/A	Differential associations by MCM subtype not investigated	MCM and suicidal ideation = 0.520 MCM and suicide planning = 0.604 MCM and suicide attempt = 0.490	Retrospective self-report of suicidal behaviours; Data does not exclusively represent suicidal behaviour in pregnancy only; The sample was hospital based potentially reducing generalisability of results
Marysko, 2010	Infant gender; Marital status; Education; No. of children	MCM associated with increased dissociative experiences postnatally. Due to re-traumatization from childbirth or through being present throughout life.	N/A	Differential associations by MCM subtype not investigated	N/A	Clinical diagnosis not screened for; Maternal self-esteem also not measured
Nagl, 2017	Anxiety; Age; Nationality; Education; Parity; Martial status; Pre-pregnancy obesity	MCM associated with postpartum depression directly and indirectly	Pre-pregnancy obesity mediated the association between MCM and postpartum depression	Sexual abuse was the only form of MCM to be associated	Sexual abuse and postpartum depression = 1.100	Length and timing of MCM, obesity and depression were not captured
Nidey, 2020	Interpersonal support; Race; Martial Status; Ethnicity; Age at delivery; Education	MCM associated with increased postnatal depression between 2 and 4-fold	N/A	Differential associations by MCM subtype not investigated	MCM and postnatal depression = 0.812	MCM sub-type not compared
Seng, 2013	Reported previously					
Zhang, 2020	Age; Education; Ethnicity; Employment; Martial status; BMI; Gestational age; Nulliparity; Unplanned pregnancy; History of abortion; Mental health history	MCM associated with suicidal ideation in pregnancy	N/A	Physical abuse MCM showed the greatest association with suicidal ideation	MCM and suicidal ideation = 0.626 Physical abuse and suicidal ideation = 0.574	A single item measure of suicidal ideation was used
Mediators of Associations Between MCM Exposure and Adverse Perinatal Outcomes						
Abajobir, 2018	Reported previously					
Agrati, 2015	Reported previously					
Benedict, 1999	Reported previously					

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Table 2 (*continued*)

Brand, 2010	Health history; Marital status; Education; Infant sex; Medication; Delivery complications/ method; Infant/ mother food intake; Maternal menstrual cycle	MCM associated with reduced maternal baseline cortisol levels; Infants also associated with lower baseline cortisol levels.	Postnatal depression mediates these associations	Differential associations by MCM subtype not investigated	MCM and maternal cortisol = 1.000 MCM and infant cortisol = 0.796	Sub-type of MCM was not separated out
Bublitz, 2020	Reported previously					
Choi, 2017	Reported previously					
De Venter, 2016	Reported previously					
England-Mason, 2017	Reported previously					
Finy, 2018	Race; Gestation; Age; Pregnancy complications	MCM associated with increased pre-pregnancy BMI and, indirectly, elevation of C-reactive proteins.	BMI acts as a mediator between associations of MCM and C-reactive protein levels	Differential associations by MCM subtype not investigated	N/A	There was not a non-pregnant compassion group used; Effects of trimesters may not have been considered
Juul, 2016	Reported previously					
Koenig, 2018	Psychiatric diagnosis; Recent stress; Infant gender/birth weight; Hair treatments	MCM associated with increased 1-AG and reduces SEA. New-borns of these mother's associated with increased 1-AG and OEA.	N/A	Differential associations by MCM subtype not investigated	MCM and 1-AG = 0.973 MCM and SEA = 1.423	Only four endocannabinoids measured instead of the whole endocannabinoidome; Sub-type of MCM not considered
Lang, 2010	Reported previously					
McDonnell, 2016	Reported previously					
Moog, 2016	Childhood SES; Current SES; Ethnicity; Smoking; Drug use; Alcohol; Depressive symptoms	MCM associated with increased pCHR concentrations across pregnancy	N/A	Multiple MCM associated with increased effects, but sub-type not considered	MCM and pCHR concentration = 0.123	Potential intergenerational transmission of the effects of maternal CT exposure that may occur in postnatal life via the detrimental effects of maternal CT-related psychological states on maternal-child relationships and suboptimal parenting was not captured
Moog, 2017	Ethnicity; SES; BMI; Childhood SES; Prenatal depression	MCM associated with increased hypothyroidism across pregnancy	N/A	Abuse and neglect MCM show these associations	N/A	Small sample size; Only two unstimulated thyroid parameters used
Morelen, 2016	Reported previously					
Muzik, 2013	Reported previously					
Muzik, 2017	Reported previously					
Nagl, 2017	Reported previously					
Oosterman, 2018	Age; Marital Status; Education; Ethnicity; Infant sex; Self-efficacy	MCM associated with reduced RSA reactivity	N/A	Differential associations by MCM subtype not investigated	N/A	Response to participants own children was not measured so paradigms may not occur in real caregiving interactions
Plaza, 2012	Age; Marital status; Education; Income; No. of children; History of abortion; Delivery method; Affective disorders history	MCM associated with increased hypothyroidism by up to 7-fold postnatally	N/A	Physical abuse had the greatest association with hypothyroidism	Physical abuse and hypothyroidism = 0.757	Current PTSD symptomology not assessed
Schreier, 2015	Age; Education; No. children; Ethnicity; Prenatal BMI; PTSD; Hair colour/ treatments	MCM associated with increased hair cortisol levels	Effect of race as the association was only found in black women and not in other racial groups	Psychical and sexual MCM associated with these outcomes. Emotional MCM was not	N/A	The cut off for MCM was 11 years old, so potential MCM in the teenage years was not captured; Hair growth differs between racial groups
Seng, 2013	Reported previously					
Talmon, 2018	Reported previously					

* Conventional practice for effect size reporting was followed and small, medium, and large effect sizes were deemed as: Cohen's $d = 0.2$, 0.5, and 0.8; Cohen's $f2 = 0.02$, 0.15, and 0.35; and odds ratios = 1.5, 2.5, and 4.3, (Cohen, 2013; Steiger, 2004; Nieminen et al., 2013). Effect sizes were converted into Cohen's d for standardised reporting.

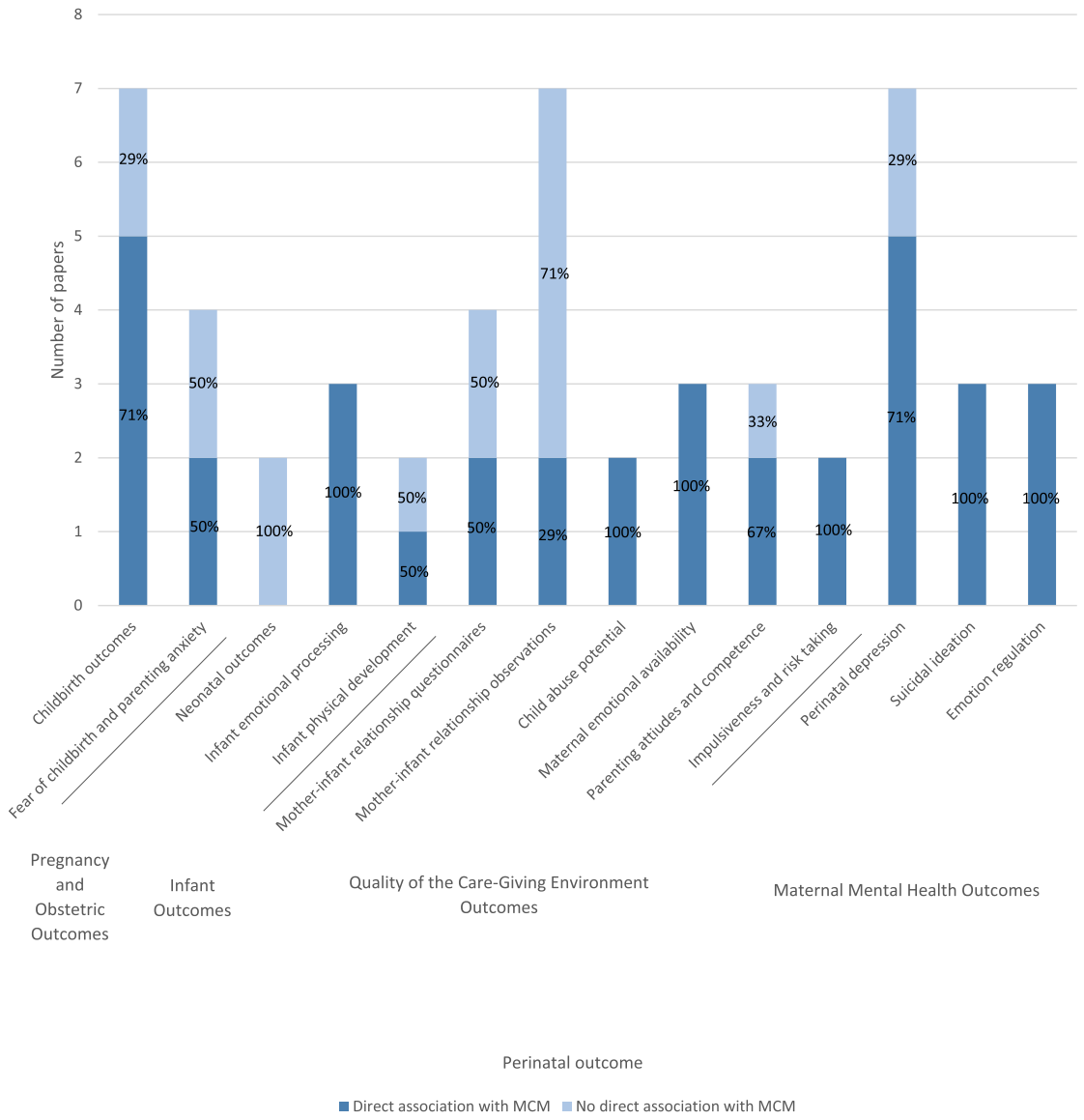

Fig. 2. The number of papers that identified an association between MCM and each specific perinatal outcome, with percentage of association shown within each outcome.

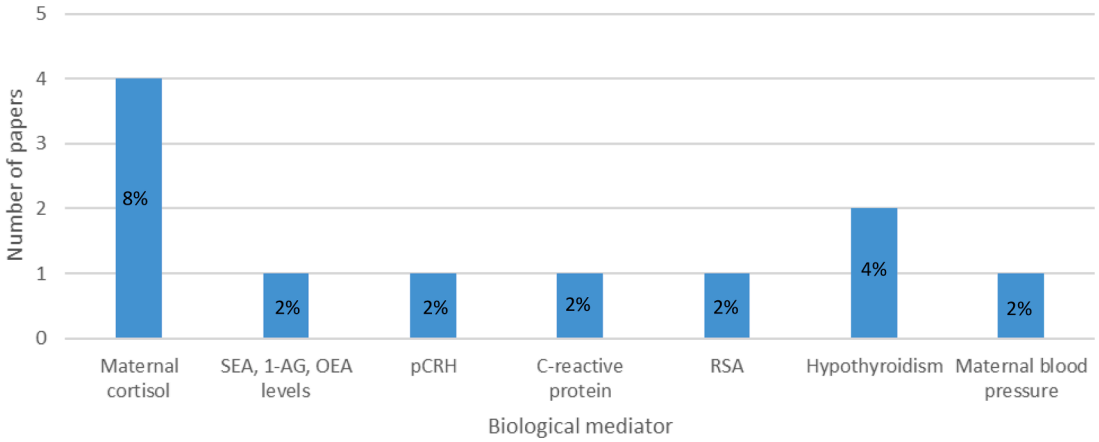

Fig. 3. The number and percentage of total papers which identified each biological mediator.

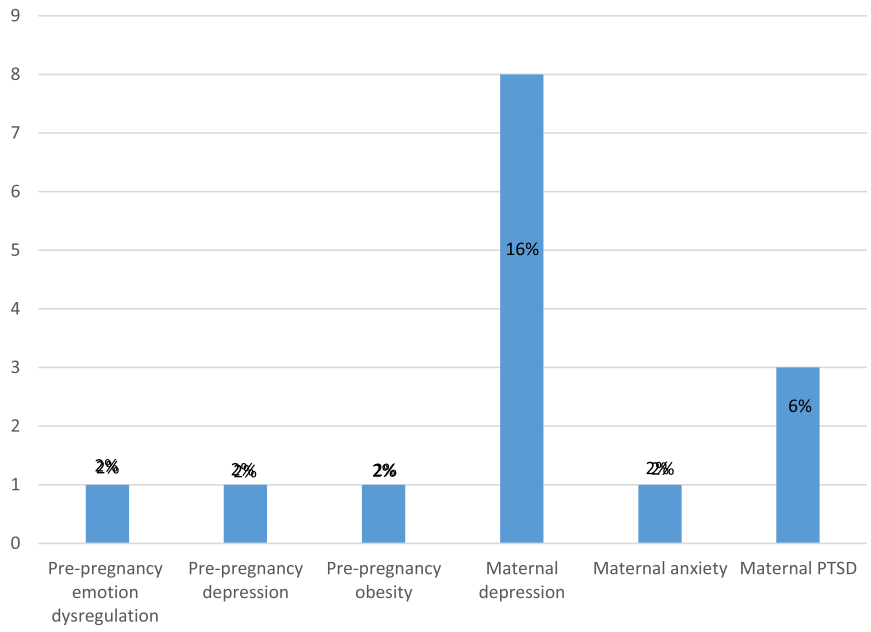

Fig. 4. The number and percentage of total papers which identified each psychosical mediator.

cost to society of approximately £8.1 billion for each annual UK birth cohort, of which 72% of the costs are related to the infant, including infant physical and emotional heath complications (Bauer et al., 2014). The intergenerational physical and financial costs of MCM exposure are increasingly recognised. Intergenerational effects can occur through disruptions to the processes that support women to prepare for pregnancy and early parenthood. Functional preparation for motherhood includes behavioural, cognitive, physiological, and epigenetic adaptations and is a process known as maternal programming (St-Cyr et al., 2017). The emotional processing, recognition and regulation ability of women during pregnancy is altered by neurobiobehvioural adaptations of maternal programming, such as changes in oxytocin levels (Byrne et al., 2019; Kim and Strathearn, 2016). An example of this is that during pregnancy, women become better at processing infant facial features (De Carli et al., 2019; Pearson et al., 2009) and develop enhanced processing of infant facial expressions that communicate distress, (Thompson-Booth et al., 2014). Further physiological changes occur to mothers in pregnancy. Key adaptations occur in the Autonomic Nervous System prenatally that lead to increased heart rate and blood pressure and decreased baroreceptor inhibition (Bałajewicz-Nowak et al., 2016). These changes ensure that the foetus is receiving the nutrition and oxygen it requires for healthy growth. Maternal programming continues into the postnatal period with further neurobiobehvioural adaptations occurring to ensure the mother is prepared for parenthood. One such example is that postnatal mother-infant interactions are associated with maternal oxytocin levels, whereby an increased maternal oxytocin response to interaction with their infant is associated with a decreased likelihood of poor mother-infant interaction quality (Kohlhoff et al., 2017). Disruption to any of these MP processes, or the biological mechanisms that mediate these processes, is hypothesised to result in the mother being less prepared for parenthood emotionally and physically. This has potential to lead to negative perinatal outcomes for both the mother and the infant.

In summary, this review aims to assess the impact of MCM exposure on maternal and infant perinatal outcomes. The societal and individual costs associated with MCM exposure underscore the importance of elucidating the effects of MCM on subsequent pregnancy, childbirth, maternal, and infant outcomes. However, the findings of studies reporting associations between MCM and perinatal outcomes are inconsistent, and the literature lacks synthesis. We aim to assess the perinatal outcomes of women with a history of MCM exposure across four outcome domains: pregnancy and obstetric; maternal mental health; infant; and the quality of the care-giving environment. Biological and psychosocial mechanisms that are examined as potential mediators of the association between MCM exposure and adverse perinatal outcomes across the included studies will be summarised.

1. Method

1.1. Search strategy

A comprehensive literature search using the Preferred Reporting Items for Systematic reviews and Meta-Analyses protocols (PRISMA; Shamseer et al., 2015) was conducted including articles published up to December 31st, 2020. The guidelines outlined by the National Health Service Centre for Reviews and Dissemination (Tacconelli, 2010) and the Cochrane Collaboration (Julian et al., 2011) were used to inform the search strategy. Eight electronic databases (Psycinfo, Pubmed, Medline, Ovid, Scopus, CINAHL, the Cochrane Library, and WOS) were searched for published articles. The table of contents of relevant journals were manually screened and the reference lists of all included articles were examined for relevant studies not identified by the literature search. The first authors of all the studies that met the inclusion criteria were emailed to identify unpublished and in press studies. Childhood maltreatment terms included ("mother* OR maternal OR parental") AND ("child* OR infan* OR history") AND ("maltreat* OR abuse OR neglect OR trauma"). These were combined with pregnancy terms ("pregnan* OR obstetric OR childbirth OR birth OR delivery OR perinatal OR prenatal OR antenatal"), mental health terms ("mental AND health, OR depression OR anxiety OR disorder"), infant terms ("infant OR child* OR bab* OR offspring OR neonat*"), and caregiving terms ("interact* OR relation*").

1.2. Inclusion and exclusion criteria

To be included in the review, studies had to assess the association between exposure to MCM and adverse perinatal outcomes. Adverse perinatal outcomes were defined in the current study as occurring during pregnancy or within 1 year postpartum, across one of the four following domains: pregnancy and obstetrics; maternal mental health;

infant; and the quality of the care-giving environment. Review papers, dissertations, or commentary papers were excluded.

The initial search identified 3928 articles. Duplicates ($N = 2038$) were removed. The remaining articles were assessed against the inclusion criteria. Two researchers independently conducted full-text reviews for $N = 99$ articles. Agreement for inclusion based on inclusion and exclusion criteria was reached on 92% of papers, with differences in judgement discussed to achieve consensus. All the above inclusion criteria were met by $N = 49$, (Fig. 1).

To assess the quality of included studies, a modified version of the Newcastle-Ottawa Quality Assessment Scale (Wells et al., 2016) was used. From the $N = 49$ papers included, the same two researchers completed the quality assessment independently for each article and agreed on 84% of judgements. Differences in ratings were discussed to achieve consensus.

1.3. Data extraction

Data was extracted and tabulated from each study following the PRISMA protocols (PRISMA; Shamseer et al., 2015; Fig. 1). This extraction included: country of origin, study design and setting, demographics and sample size, assessment measures of maternal childhood maltreatment, outcome measures and effect size. In addition, aims and hypothesis, recruitment methods, inclusion and exclusion criteria, and number of groups was also extracted. Table 1 shows the methodological characteristics of included studies. The extracted data was reviewed using a descriptive approach to provide an overview of the findings. Two researchers performed this process independently and compared extractions. Agreement was initially met on 96% of judgements. Differences in ratings were discussed to achieve consensus. Conventional practice for effect size reporting was followed and small, medium, and large effect sizes were deemed as: Cohen's $d = 0.2$, 0.5, and 0.8; Cohen's $f\,2 = 0.02$, 0.15, and 0.35; and odds ratios = 1.5, 2.5, and 4.3, (Cohen, 2013; Steiger, 2004; Nieminen et al., 2013).

2. Results

Outcomes were grouped as being either pregnancy and obstetric (e.g., childbirth outcomes, fear of childbirth and parental anxiety); infant outcomes (e.g., neonatal outcomes, infant emotional processing, infant physical development); quality of the caregiving environment outcomes (e.g., mother-infant relationship quality, child abuse potential, maternal emotional availability, parenting attitudes and competence, impulsiveness and risk taking); and maternal mental health outcomes (e.g., perinatal depression, suicidal ideation, emotion regulation). Table 2 shows the results, limitations, and effect size for all included studies.

2.1. .

2.1.1. Study characteristics

The inclusion/exclusion criteria were met by $N = 49$ studies reporting on $N = 47$ different samples. Studies reported on pregnancy and obstetric outcomes ($n = 11$), infant outcomes ($n = 7$), quality of the caregiving environment outcomes ($n = 19$), and maternal mental health outcomes ($n = 16$). Fig. 2 displays the number of studies assessing the association of MCM with each outcome. Twenty-four of the 49 studies reported on a biological or psychosocial outcome hypothesised to mediate the association between MCM exposure and adverse maternal and/or infant perinatal outcomes (Fig. 3 and Fig. 4).

The total number of women included in this review was 19,977 sampled from a range of countries: USA ($n = 26$), Germany ($n = 7$), Canada ($n = 4$), Australia ($n = 2$), Peru ($n = 2$), Belgium ($n = 1$), China ($n = 1$), Israel ($n = 1$), Mexico ($n = 1$), Netherlands ($n = 1$), South Africa ($n = 1$), Spain ($n = 1$), and Turkey ($n = 1$). Most studies, $N = 39$ (80%), reported on their inclusion or exclusion criteria. Inclusion criteria was not clearly defined by $N = 6$ (12%) of studies and $N = 4$ (8%) studies did not state either inclusion or exclusion criteria. MCM was reported by 6700 (33.54%) women, however, the heterogeneity in reporting of MCM exposure presents a challenge for generalising these findings, reduces the external validity, and complicated replication.

Maternal age ranged from 12 to 48 years, although this should be interpreted with caution as $N = 21$ (43%) studies did not report an upper range limit, and $N = 3$ (6%) studies did not specify the age of their sample. Of the 49 studies, $N = 20$ (41%) conducted the initial assessment in-utero. Of these 20 studies, $N = 13$ conducted antenatal assessments only whereas $N = 7$ included both a pregnancy and postpartum assessment. Postnatal only assessments were conducted in $N = 27$ (55%) studies. The exact timing of assessments during the perinatal period was not reported by $N = 2$ (4%) studies. A longitudinal design was used in $N = 25$ (51%) studies, whereas 24 (49%) used a cross-sectional design.

Participants for whom data could be accessed identified as Caucasian (27.86%, $n = 5569$), African American/Black (10.68%, $n = 2140$), Asian/Pacific Islander (9.57%, $n = 1911$), Mestizo (8.27%, $n = 1656$), Hispanic/Latina (4.47%, $n = 895$), mixed race (1.12%, $n = 203$), Middle Eastern (0.09%, $n = 19$), Native American (0.06%, $n = 11$), or other/unknown (5.89%, $n = 1181$). The ethnicity of $N = 6392$ (31.99%) participants in $N = 10$ (20%) studies was not reported. This highlights uncertainty in the ethnicity of the participants across the included studies as well as ethnic diversity across the included studies where ethnicity was reported. However, $N = 29$ (59%) studies had inclusion/exclusion criteria that required participants to speak the native language of the country that the study was conducted in. This may have limited the opportunity for women from ethnically diverse backgrounds to participate.

Sample size varied greatly, ranging from 41 to 3081 participants. Few studies, $N = 7$ (14%), calculated the required power to detect a significant effect. Well powered studies were self-reported by $N = 4$ (8%) studies, whereas $N = 2$ (4%) studies were self-reported as underpowered. Most studies, $N = 42$ (86%), did not report power calculations and sample size estimates, making it impossible to determine whether the samples were large enough to produce reliable outcomes.

2.1.2. Variability in the measurement of maternal childhood maltreatment

The measurements of MCM varied with 12 different measures used (Table 1). The most widely used measure was the Childhood Trauma Questionnaire (CTQ) ($n = 31$), which captures both the nature of traumatic experiences in childhood, and the extent to which the participant found the event traumatic. The CTQ does not however capture the duration and specific timing of the maltreatment. Other methods, such as the Trauma History Questionnaire (THQ), whilst capturing these aspects, fails to identify the severity of the specific traumatic experience. The variability in measures of MCM may explain some of the inconsistent findings reported in the literature.

2.2. Pregnancy and obstetric outcomes

The relationship between MCM and pregnancy and obstetric outcomes was reported on by $N = 11$ studies. These included childbirth outcomes, and fear of childbirth & parenting anxiety.

2.2.1. Childbirth outcomes

Evidence for the impact of MCM on childbirth outcomes was inconsistent and limited ($n = 7$). Only one study explored the risk of miscarriage following MCM (Abajobir et al., 2018). In this study, MCM exposure was associated with an elevated risk of miscarriage, particularly when the MCM was emotional abuse. A limited number of studies ($n = 3$) examined the impact of MCM on infant birthweight and gestation, with inconsistent findings reported. One study found that following the statistical control of correlated risk factors, MCM exposure was directly associated with giving birth to infants of lower birth weight but was not associated with the number of weeks gestation that the infant was born (Stevens-Simon et al., 1994). In contrast, after accounting for

the impact of correlated risk factors (e.g. substance and alcohol use) two studies (Altemeier et al., 1986; Benedict et al., 1999) found no association between MCM exposure and infant birth weight or the number of weeks gestation at birth. It is noteworthy that the prenatal exposure to illicit substances and alcohol could mediate the association between MCM and adverse birth outcomes, however, these studies did not conduct these analyses.

MCM exposure was shown to increase the likelihood of preterm delivery in the 3 of 3 studies that measured this outcome, defined in these studies as delivery at less than 37 weeks' gestation. This association remained once maternal age, educational status, smoking status, miscarriage history (Christiaens et al., 2015), and maternal stress and depression (Bublitz et al., 2020) were accounted for, showing a direct association, as well as potential mediating pathways via these controlled for factors. There was evidenced that the MCM sub-type of childhood sexual abuse was particularly related to pre-term delivery in one study (Leeners et al., 2014). Whereas Bublitz and colleagues (Bublitz et al., 2020) found the combination of childhood emotional and physical abuse to convey the greatest risk for preterm delivery. In summary, the association between MCM exposure and adverse childbirth outcomes are shown by a limited number of studies, but with strong implications regarding the role MCM subtype plays.

2.2.2. Fear of childbirth and parenting anxiety

Associations between MCM exposure and fear of childbirth and parenting anxiety were limited ($N = 4$). Two studies showed a direct association of MCM exposure and parenting anxiety. Stevens and colleagues (Stevens et al., 2017) found MCM to be associated with lower self-efficacy in communicating obstetric care preferences. Furthermore, Özşahin (2020) found MCM exposure was associated with elevated parenting anxiety and reduced acceptance of the maternal role. One study (Bowman et al., 2009) found no difference in levels of parenting anxiety between mothers with and without a history of MCM exposure. However, in this study, most participants had attended parenting classes which may have provided the required support to successfully prepare for pregnancy and parenthood. In one study, no direct association of MCM on fear of childbirth was identified, (Talmon et al., 2018). Elevated maternal anxiety in relation to childbirth and the parenting role could disrupt species typical adaptations to pregnancy and parenthood and associated maternal programming processes.

2.3. Infant outcomes

The relationship between MCM and infant outcomes was reported in $N = 7$ studies. These outcomes included neonatal behaviours, infant emotional processing and infant physical development.

2.3.1. Neonatal outcomes

There was no evidence for an association between MCM exposure and neonatal outcomes in the 2 of 2 studies that measured this outcome. There was no association between MCM and infant's Brazelton Neonatal Behavioural Assessment Scale scores in a sample of low-income, white mothers (Altemeier et al., 1986). Similarly, in a mixed-income, mixed-race sample, MCM did not predict infants' 5-minute APGAR score (Benedict et al., 1999).

2.3.2. Infant emotional processing

Evidence of a relationship between a history of MCM and infant affect was shown in the 3 of 3 studies that reported on this outcome. Collectively, findings suggest maternal psychopathology and emotional processing deficits associated with MCM exposure play a key role in infants' affectivity and temperament in their first year. Increased infant negative affectivity in their first year postpartum was shown to be associated with MCM (Agrati et al., 2015). Another study found that MCM predicted higher levels of negative infant affectivity at 6 months postpartum (McDonnell et al., 2016). Lang and colleagues (2010) found MCM subtype was a discriminating factor, whereby physical MCM was associated with increased infant difficulty when recovering from distress. Indeed, Lang and colleagues (2010) have shown that emotional abuse in childhood predicted elevated mother-infant interactional dysfunction (Lang et al., 2010). Thus, there is emerging evidence that the MCM sub-type of emotional abuse is an important risk factor for infant emotional difficulties.

2.3.3. Infant physical development

Evidence pertaining to the associations between MCM and infant physical development was extremely limited ($N = 2$). Choi et al. (2017), found that MCM was not related to infant growth across the first year postpartum. Moog and colleagues (2018) found that new-borns of mothers who had experienced MCM developed significantly smaller overall brain size and less grey matter volume than infants born to mothers with no history of MCM.

2.4. Quality of the care-giving environment outcomes

Nineteen studies reported on the relationship between MCM exposure and the quality of the care-giving environment outcomes. These outcomes included mother-infant relationship quality, child abuse potential, maternal emotional availability, parenting attitudes and competence, and impulsiveness and risk taking.

2.4.1. Mother-infant relationship quality - questionnaire studies

Associations between MCM exposure and maternal rated mother-infant relationship quality was observed across $N = 4$ studies. Two studies found no direct association between MCM and maternal rated mother-infant relationship quality (Choi et al., 2017; Seng et al., 2013). Guyon-Harris and colleagues (Guyon-Harris et al., 2020) found mothers with a history of MCM to report more difficulties in understanding their infant's emotional cues as well as increased role and boundary confusion with their infants. A further study found that a history of emotional MCM led to significantly higher levels of mother-infant interactional dysfunction (Lang et al., 2010). In this study, exposure to emotional abuse during childhood predicted increased maternal affect dysregulation which in turn had a negative impact on the quality of the mother-infant relationship. Collectively, these studies highlight the importance of identifying the MCM sub-type.

2.4.2. Mother-Infant relationship quality - observational studies

The association between MCM exposure and directly observed mother-infant interaction has been reported in $N = 7$ studies. Observational studies refer specifically to studies in which researchers observe mothers and infants interacting and score the interaction on predetermined criteria. Five studies found no direct association between MCM and the quality of the mother-infant relationship (Juul et al., 2016; Martinez-Torteya et al., 2014; Muzik et al., 2013, 2017; Stacks et al., 2014). In contrast, Moehler and colleagues (2007) found MCM exposure predicted more intrusive maternal behaviours which in turn predicted disorganised infant attachment. Highlighting inconsistent findings in the literature, Morelen and colleagues (2016) found a positive association, whereby MCM exposure predicted increased maternal positive affect during mother-infant interactions.

2.4.3. Child abuse potential

Evidence of a relationship between a history of MCM and child abuse potential was limited yet consistent across the $n = 2$ studies that measured this outcome ($N = 2$). A history of MCM exposure, particularly emotional or physical abuse predicted a higher child abuse potential (Bert et al., 2009), as well as greater levels of anger, and more violent physical discipline toward infants (Altemeier et al., 1986). Further research is needed to determine if these associations are replicated in other samples.

2.4.4. Maternal emotional availability

A history of MCM was shown to reduce observed emotional availability in 3 of 3 studies that reported on this outcome (Fuchs et al., 2015; MacMillan et al., 2020; Moehler et al., 2007). Associations remained significant once maternal age, education, psychosocial support and number of children (Fuchs et al., 2015), as well as recent stressful life events and birth complications (MacMillan et al., 2020) were controlled for. These studies demonstrate direct associations, yet these studies only included these potential mediators as statistical covariates, and their mediating effect on maternal emotional availability should be considered. As well as reduced emotional availability, increased maternal intrusiveness was also shown to be associated with MCM exposure (Moehler et al., 2007). A consistent, lasting, direct association between MCM exposure and mother's ability to function effectively in a relationship with their infant is shown.

2.4.5. Parenting attitudes and competence

Evidence for an association between MCM exposure and parenting attitudes and competence was inconsistent across the three studies that reported on this outcome. No association between MCM and maternal parenting competence was reported in one study (Sexton et al., 2015). However, in a second study, MCM predicted reduced parental confidence (Lang et al., 2010). Fava et al. (2016) found the impact of MCM on parenting attitudes to be dependent on the sub-type of MCM experienced, a factor not considered in the previous two studies. For example, if the MCM had been parent-perpetrated, mothers tended to show more positive attitudes towards parenting, such as increased patience and openness with their infant. However, with other forms of MCM the greater the exposure to MCM, the more negative the parenting attitudes (Fava et al., 2016). These findings further highlight the importance of MCM sub-type and adverse perinatal outcomes.

2.4.6. Impulsiveness and risk taking

Evidence of a relationship between MCM exposure and impulsiveness and risk taking during the perinatal period was found in 2 of 2 studies that measured this outcome. Women exposed to sexual abuse were more likely to partake in a higher number of risky health related behaviours, such as smoking during pregnancy (Leeners et al., 2014). Similarly, mothers with a history of exposure to the MCM subtypes of physical or sexual abuse report increased difficulties in emotion regulation, impulsiveness and risk-taking during pregnancy (Moehler et al., 2009).

2.5. Maternal mental health outcomes

Thirteen studies reported on the relationship between MCM and maternal mental health outcomes. These outcomes included depression (both pre- and postnatal), suicidal ideation, emotion regulation, and dissociative experiences.

2.5.1. Perinatal depression

Of the 13 studies that assessed the impact of MCM on maternal mental health outcomes during the perinatal period, 7 measured depression. Of these 7 studies, $N = 3$ initially measured prenatal depression, $N = 2$ assessed postnatal depression, and in two studies, both prenatal and postnatal depression were assessed. Overall exposure to MCM increased the risk of prenatal depression by up to 2.6 times (Lara et al., 2015). Exposure to sexual abuse heightened the risk of prenatal depression (Benedict et al., 1999). There is evidence that the impact of MCM is cumulative, as Barrios and colleagues (2015) found that MCM only predicted elevated rates of depression during pregnancy when the individual was exposed to both physical and sexual maltreatment. Similarly, MCM exposure was shown to have a cumulative effect on the risk of developing postnatal depression in the 2 of 4 studies that measured this outcome. As MCM exposure increased, the likelihood of postnatal depression generally increased between 2 and 4-fold (Nidey et al., 2020). In keeping, exposure to childhood sexual abuse was associated with postpartum depression (Nagl et al., 2017). Finally in two studies, no direct associations between MCM exposure and the risk of perinatal depression was found (De Venter et al., 2016; Seng et al., 2013). Overall, findings suggest that MCM predicts an elevated risk of depression during the perinatal period, with the MCM subtypes of sexual and physical abuse being particularly pertinent risk factors. It is noteworthy however that few studies measured the impact of the MCM subtype of emotional abuse, which likely co-occurs in the context of physical and sexual abuse.

2.5.2. Suicidal ideation

Three of three studies found an association between MCM exposure and elevated suicidal ideation during the perinatal period (B. Leeners et al., 2014; Levey et al., 2018; Zhang et al., 2020). However, analysis at the level of MCM sub-type was inconsistent. Leeners and colleagues (Leeners et al., 2014) found sexual abuse to be the greatest risk factor for suicidal ideation whereas Zhang and colleagues (Zhang et al., 2020) found physical abuse to be the strongest predictor.

2.5.3. Emotion regulation

MCM was consistently associated with disruptions to postpartum maternal emotion regulation in all three studies that explored this outcome (England-Mason et al., 2017; England-Mason et al., 2018; Marysko et al., 2010). Difficulties were related to using effective emotion regulation strategies, emotional awareness, and the clarity of understanding one's own emotions (England-Mason et al., 2017). Maternal emotion regulation difficulties are associated with an attentional bias in the context of emotional stimuli, such as reduced maternal responding to infant's displays of emotion (England-Mason et al., 2018). In a different study, MCM was associated with increased dissociative experiences (a lack of the normal integration of thoughts, feelings, and experiences into the stream of consciousness and memory) throughout the first year postpartum (Marysko et al., 2010).

2.6. Mediators of associations between MCM exposure and adverse perinatal outcomes

The documented associations between MCM exposure and adverse perinatal outcomes suggest disruption to the processes of maternal programming. Biological and psychosocial mechanisms hypothesised to underpin the association between MCM exposure and adverse perinatal outcomes were not explicitly sought for in this review's search strategy. However, the relationship between MCM and potential mediating factors was identified by a sub-set of studies that met the inclusion criteria.

MCM and infant and maternal biological outcomes was reported on by $N = 11$ studies that met our inclusion criteria. These studies typically tested biological markers (e.g. cortisol levels, placental outcomes, neurotransmitter outcomes, hormonal outcomes, and respiratory sinus arrhythmia reactivity) as mediators of the association between MCM exposure and adverse perinatal outcomes (Fig. 3). Of these 11 studies, $N = 4$ investigated the relationship between MCM exposure and altered maternal HPA axis functioning. Maternal cortisol levels were shown to be lower in mothers with a history of MCM exposure, both at baseline (Brand et al., 2010; Enlgand-Mason et al., 2017) and in response to a stressor paradigm (Juul et al., 2016). Infants of these mothers were also found to have lower baseline cortisol levels (Brand et al., 2010). Maternal emotion regulation difficulties were shown to partially mediate the association between MCM exposure and maternal HP axis functioning (England-Mason et al., 2017). Postnatal depressive symptoms further moderated the association between MCM exposure and maternal HP axis functioning (Brand et al., 2010). There is limited evidence testing associations between MCM sub-type, biological mechanisms, and adverse perinatal outcomes. One study found physical and sexual maltreatment but not emotional abuse to be associated with cortisol levels sampled from the hair of MCM exposed mothers (Schreier

et al., 2015).

The hair of mothers with a history of MCM exposure has also been tested for altered neurotransmitter functioning (Koenig et al., 2018). In this study, significantly higher levels of the neurotransmitter 1-AG and significantly lower levels of Neurotransmitter SEA was documented in MCM exposed compared to non-MCM exposed mothers (Koenig et al., 2018). Both 1-AG and SEA are endogenous lipid-based retrograde neurotransmitters that have been linked to a lower availability of anti-inflammatory potential, chronic pain, and decreased pain tolerance. New-borns of MCM exposed mothers exhibited higher levels of 1-AG and N-oleoylethanolamide (OEA), an ethanolamide lipid agonist that regulates feeding and body weight (Koenig et al., 2018).

Placental corticotrophin-releasing hormone (pCRH) production is a further biological mechanism tested to explain the association between MCM exposure and adverse perinatal outcomes. Over gestation, significantly greater levels of pCRH were found in women exposed to MCM (Moog et al., 2016). Exposure to two types of maltreatment corresponded to an almost 25% increase in pCRH concentrations toward the end of gestation (Moog et al., 2016). Further biological mechanisms considered included parasympathetic nervous system response, as measured by respiratory sinus arrhythmia (Oosterman et al., 2018), thyroid dysfunction (Moog et al., 2017; Plaza et al., 2012), changes in maternal blood pressure (Bublitz et al., 2020) and alterations to C-reactive protein levels (Finy et al., 2018). The findings of these individual studies that highlight novel avenues for future research are summarised in Table 2.

Alongside biological mediators, psychosocial correlates of MCM exposure (e.g., maternal psychopathology and emotion dysregulation) that could potentially confound and/or mediate the observed associations were identified by all of the included studies. However, only 11 of 49 studies conducted statistical analyses that tested such psychosocial factors as mediating mechanisms (Fig. 4). Pre-pregnancy emotional dysregulation was shown to mediate the association between MCM and the risk of miscarriage (Abajobir et al., 2018), with pre-pregnancy depression (De Venter et al., 2016; Seng et al., 2013) and pre-pregnancy obesity (Nagl et al., 2017) mediating the association between of MCM exposure and elevated rates of perinatal depression.

Across several perinatal outcomes, maternal pre- and/or postnatal depression was identified as a mediating mechanism. For example, maternal depression was shown to mediate the association between MCM exposure and infant negative affectivity at 6 months (McDonnell et al., 2016), elevated mother-infant interactional dysfunction (Lang et al., 2010), reduced infant growth (Choi et al., 2017), maternal rated mother-infant relationship difficulties (Choi et al., 2017; Seng et al., 2013), increased mother-infant relationship impairments (Muzik et al., 2013), increased maternal positive affect during mother-infant interactions (Morelen et al., 2016), and reduced parental confidence (Lang et al., 2010). Similarly, maternal perinatal anxiety mediated the association between MCM exposure and infant negative affectivity (Agrati et al., 2015,) whereas current maternal PTSD symptoms strengthened associations between MCM exposure and increased mother-infant relationship impairments (Muzik et al., 2013, 2017), and increased maternal positive affect during mother-infant interactions (Morelen et al., 2016). Overall, maternal psychopathology and emotion regulation difficulties have been the most widely tested mechanisms of effect in studies that have examined MCM exposure and adverse perinatal outcomes.

3. Discussion

We explored the relationship between MCM exposure and adverse perinatal outcomes including pregnancy and obstetric, infant, quality of the care-giving environment, and maternal mental health. Hypothesised biological and psychosocial mechanisms identified in the included studies were synthesised. MCM was consistently associated with alterations in infant's emotional processing, parental child abuse potential, maternal emotional availability, impulsiveness and risk taking, suicidal ideation, and maternal emotion regulation difficulties. Analysis revealed that associations between MCM and adverse perinatal outcomes are influenced by MCM subtype, and biologically and psychologically mediated effects. Except for preterm delivery, associations between MCM exposure and childbirth outcomes, fear of childbirth, parenting anxiety, maternal rated mother-infant relationship quality, and parental sense of competence and parenting attitudes were inconsistent. In contrast, observational studies that have micro-analysed the quality of the mother-infant relationship have demonstrated that MCM exposure is associated with elevated interactional difficulties between mother and infant. MCM was consistently associated with difficulties in both maternal and infant emotion regulation and maternal emotional availability. Few studies investigated perinatal outcomes by MCM sub-type, but across those that did, exposure to emotional and sexual abuse during childhood were the most consistent predictors of adverse perinatal outcomes.

Analysis of the included studies has shown that MCM exposure is associated with several highly correlated risk factors for adverse perinatal outcomes including pre-pregnancy psychopathology, SES, and substance use. Depending on the adverse perinatal outcome under investigation, the correlated risk factors have been found to attenuate (e.g., SES and substance use) or mediate (e.g., pre-pregnancy psychopathology) the association between MCM exposure and adverse perinatal outcome(s). For example, maternal psychopathology prior to the perinatal period has been shown to mediate the association between MCM exposure and difficulties in the mother-infant relationship as reported by mothers and observed by independent raters.

This review identifies several pre- and post-natal processes that are associated with MCM exposure, either directly, or via mediating mechanisms. Such disruption can affect the maternal programming process (St-Cyr et al., 2017). If exposure to MCM is directly impeding this process or doing so via psychosocial and/or biological mechanisms, then mothers may be less well prepared for parenthood. Given the interconnectedness of the perinatal outcomes captured in the current study (e.g., maternal and infant emotion regulation; adverse birth outcomes that negatively impact on mother and child), and the maternal programming process, including factors such as emotional processing (De Carli et al., 2019; Pearson et al., 2009; Thompson-Booth et al., 2014) and oxytocin levels (Byrne et al., 2019; Kim and Strathearn, 2016; Kohlhoff et al., 2017), it could be that associations between MCM and adverse perinatal outcomes at least in part reflect genetic and/or epigenetic mechanisms. As such, future research should consider using genetically informative designs and investigating epigenetic mechanisms to better understand the association between MCM exposure and adverse perinatal outcomes.

3.1. MCM subtypes

In studies that explored MCM by sub-type, it was often found that exposure to different MCM sub-types influenced the risk of adverse perinatal outcomes in differing ways. It is noteworthy that in many studies, analyses at the level of MCM subtype were not reported, and therefore associations between MCM exposure and adverse perinatal outcomes are not fully understood. By separating out abuse and neglect MCM sub-types initially, and then further delineating into physical, emotional, and sexual abuse, underlying associations may be detected that are not apparent when MCM is analysed as a binary or cumulative variable. Overall, the findings of this review indicate that childhood sexual abuse is particularly associated with adverse perinatal outcomes. Importantly, many studies do not fully explore emotional abuse. Childhood physical abuse is highly associated with emotional abuse (Brown et al., 2019), and being physically hurt by a trusted adult invariably has an impact upon emotional functioning (Miller-Perrin et al., 2009). Future research should examine the differential impact of all MCM sub-types to better understand the associated perinatal risk

whilst accounting for the often-high co-occurrence of MCM subtypes.

3.2. Mediating pathways and directions for future research

In some studies, direct associations between MCM exposure and adverse perinatal outcomes were not detected. Rather, indirect pathways between MCM exposure, and adverse perinatal outcomes were reported. Across the adverse perinatal outcomes encompassed in this review, maternal perinatal depressive symptoms, emotion dysregulation difficulties and pre-pregnancy psychopathology were found to mediate the association between MCM exposure and perinatal outcomes. Many psychosocial factors were identified as covariates by the included studies and were then statistically adjusted for within the analysis. These covariates included alcohol use (explored by $N = 5$ papers), substance use ($N = 4$), maternal age ($N = 4$), education ($N = 31$), smoking ($N = 3$), and ethnicity ($N = 22$). Exploring the potential mediating properties of such covariates may highlight further pathways of effects between MCM exposure and perinatal outcomes. The prenatal exposure to maternal smoking and alcohol use has long been associated with biologically and psychologically mediated adverse infant outcomes (Bandoli et al., 2019; Schoeps et al., 2018; Shisler et al., 2017; Veisani et al., 2019). As such, future research should consider capturing the complex interplay between multiple co-occurring risk factors that are impacting on mother and infant.

Biological mechanisms hypothesised to underpin these associations were tested in just under 1 in 4 studies identified by the systematic literature search. Our ability to synthesise these disparate findings is compromised by the limited number of studies focusing on each potential mediating process and heterogeneity in study designs and methodology. Nevertheless, alterations to the functioning of the HPA axis, as indexed by altered cortisol functioning, has been consistently identified by a growing number of studies as a mediating mechanism in the context of MCM exposure and adverse perinatal outcomes. Additional biological mechanisms with theoretically plausible putative pathways have been identified including thyroid dysfunction (Moog et al., 2017; Plaza et al., 2012), changes to C-reactive protein and neurotransmitter levels (Finy et al., 2018; Koenig et al., 2018), and elevated pCRH production during gestation (Moog et al., 2016). These individual studies highlight novel avenues for future research in the context of MCM exposure and adverse perinatal outcomes. Findings are in keeping with review papers that highlight the mediating mechanisms between exposure to childhood maltreatment and adverse biological and psychological outcomes in adolescence and adulthood such as MCM and HPA axis functioning (Hunter et al., 2011) and cortisol levels and prenatal distress (Mustonen et al., 2018).

Psychosocial mediating pathways were explored within included studies. Current symptoms of maternal perinatal depression (Choi et al., 2017; Lang et al., 2010; McDonnell et al., 2016; Morelen et al., 2016; Muzik et al., 2013; Seng et al., 2013), anxiety (Agrati et al., 2015) and PTSD (Morelen et al., 2016; Muzik et al., 2013, 2017) were identified as mediators of associations between MCM exposure and a range of adverse perinatal outcomes. Pre-pregnancy functioning has also been implicated, including pre-pregnancy emotional dysregulation (Abajobir et al., 2018), depression (De Venter et al., 2016; Seng et al., 2013) and obesity (Nagl et al., 2017). Thus, these findings highlight the possibility that at least in part, associations between MCM exposure and perinatal adversity may reflect genetic mechanisms in addition to other biological and environmentally mediated effects (e.g. the foetal programming hypothesis). For example, genetic risk factors have been implicated in multiple perinatal outcomes, including miscarriages (Laisk et al., 2020; Suzumori and Sugiura-Ogasawara, 2010), infant brain development (Qiu et al., 2017), and perinatal depression (Rantalainen et al., 2020; Tirumalaraju et al., 2020). Future research that uses genetically informative designs is needed to understand the complex interplay more fully between biological and psychological risk factors in the context of MCM exposure and subsequent perinatal adversity.

3.3. Strengths and limitations

A comprehensive literature search in line with PRISMA protocols identified many individual studies for review. The inclusion of studies that measured a broad number of outcomes for both the mother and infant, throughout both pregnancy and the postpartum period are strengths of this review. A meta-analysis was not conducted due to the small numbers of studies included in most outcome domains. However, the decision to include only research published in the English language potentially excludes many relevant studies in non-English speaking populations. The 'file draw' problem is also a potential limitation, as the search strategy did not focus on unpublished research, and as such, conclusions based on the association between MCM exposure and perinatal adversity may be over or indeed underestimated in the current study.

3.4. Implications for clinical practice and policy

Our findings suggest that a maternal history of childhood maltreatment is associated with adverse perinatal outcomes for both the mother and the infant. This raises the debate of the potential benefits and risks of screening all mothers-to-be for MCM exposure to enable early intervention and prevention of adverse perinatal outcomes. It is noteworthy that screening raises important ethical and service level implications for health and social care workers conducting assessments of MCM exposure, such as if a mother were to report maltreatment that was perpetrated by someone still present in her life, or whether following detection, there were no universally available services to meet the identified need. Further guidance on screening and assessments of trauma can be explored from the Center for Substance Abuse Treatment (2014), and procedures used from screening for domestic violence during pregnancy (Saunders, 2000) should be considered. If screening and detection pathways were to be developed, our findings indicate that particular focus should be given to maltreatment sub-type in relation to each perinatal outcome domain, although consistently, childhood sexual abuse is associated with an elevated risk of adverse perinatal outcomes.

There are potential intergenerational implications of MCM exposure (Bert et al., 2009; Plant et al., 2018; Su et al., 2020; van de Ven et al., 2020). If the necessary early support and intervention is not put in place, the intergenerational cycle of MCM and perinatal risk will likely persist. It is therefore the case that the perinatal period represents an optimal time for detection and early intervention to prevent the intergenerational implications of childhood maltreatment.

3.5. Implications for research

There is limited evidence for many outcome domains, making it difficult to draw strong conclusions and across perinatal outcome domains, different measures and procedures were used to assess the same outcome. There was large variability in the measures used to assess MCM, which may explain some of the inconsistent findings reported in the literature. Many studies relied on maternal self-report measures, which may introduce bias through parent's linguistic skills, cognitive ability, affect, or the tendency to respond in a socially desirable manner (Corcoran and Fischer, 2013). Almost all MCM and perinatal outcome measures were self-report, and all MCM measures were retrospectively reported which may reduce the quality of data through a lack of recall of events and attributional biases (Gerdner and Allgulander, 2009; Mizuki and Fujiwara, 2020). Observations of parent-infant interactions, clinical interviews, or access to medical records are recommended for greater accuracy and increased objectivity in the measurement of perinatal outcomes (Lotzin et al., 2015). However, observational methods and clinical interviews involve a higher investment in training, technical equipment, and vastly increased resources for data collection and analysis when compared to questionnaire-based studies (Bagner et al., 2012), which may explain the limited use of these research methods,

particularly in studies with larger samples.

To ensure that research continues to further our knowledge of the impact of MCM, standardized measures of childhood maltreatment that incorporate indices of impact and severity such as the CTQ should be used. The use of observational methods to assess the quality of the mother-infant relationship is strongly recommended, as despite the increased costs involved, the data obtained is far more detailed and reveals a different picture to maternal reports that are subject to attributional biases. Multi-method studies also address the issue of shared method variance where mothers report on both the exposure to MCM and the perinatal outcome(s). Larger sample sizes with appropriate power, using longitudinal designs with repeated measures would be useful for furthering understanding.

4. Conclusion

MCM was consistently associated with difficulties in both maternal and infant emotional regulation and availability. Disturbances in relationships were shown between mother and infant when a history of MCM was present. MCM sub-types appear to impact perinatal outcomes in different ways. Exposure to childhood sexual abuse predicted the greatest disruption to perinatal outcomes. Biological mechanisms, such as HPA axis functioning and elevated pCRH production during gestation, as well as psychosocial mechanisms, such as maternal psychopathology, have been found to mediate some of the documented associations between MCM exposure and adverse perinatal outcomes, however replication is required. This review furthers our understanding of the impact of MCM on both the mother and infant during the perinatal period and highlights the need for appropriate identification of MCM history. However, variability in the measurement of MCM, and the limitations of each individual study, tempers the strength of conclusions. Replication of studies using longitudinal and genetically informative designs with in-depth observational and interview assessments would help consolidate our knowledge of risk and protective mechanisms.

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Declaration of Competing Interest

No conflict of interest was recognised during the writing of this article.

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