

Supplementary Table 1. PRISMA 2020 Checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	4-5
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	5
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	6-7
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	6
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	6
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	--
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	8
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	9
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	--
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	--
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	9

Section and Topic	Item #	Checklist item	Location where item is reported
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	9
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	NA
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	NA
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	NA
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	8
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	10
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	--
Study characteristics	17	Cite each included study and present its characteristics.	12-15
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	10
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	10-12
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	10
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	NA
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	NA
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	NA
Reporting biases	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	NA
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	10
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	16-18
	23b	Discuss any limitations of the evidence included in the review.	18-19
	23c	Discuss any limitations of the review processes used.	19
	23d	Discuss implications of the results for practice, policy, and future research.	19

Section and Topic	Item #	Checklist item	Location where item is reported
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	2&6
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	6
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	20
Competing interests	26	Declare any competing interests of review authors.	20
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	20

NA: not applicable.

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Supplementary materials

Supplementary Table 2: Searching terms and outputs for six databases.

Database	Terms	Result
PubMed	((Probiotic* OR Prebiotic* OR Synbiotic* OR ("Probiotic* OR Prebiotic* OR Symbiotic*" [MeSH] OR ("Probiotic* OR Prebiotic* OR Synbiotic*" [All Fields]))) AND (Pregnancy OR Lactation OR Antepartum OR Prenatal OR Perinatal OR Postpartum OR ("Pregnancy"[MeSH] OR ("Pregnancy" [All Fields]))) AND (Preeclampsia OR Hypertension disorders OR Gestational diabetes mellitus OR Premature rupture of membrane OR Mastitis OR Breast engorgement OR Mental disorder OR Psychosis OR Depression OR Anxiety OR Safety OR Pregnancy outcome OR Neonatal outcome OR Infection OR Preterm-labor OR Abortion OR Miscarriage OR ("Complication* OR Outcome*" [All Fields])) AND (Systematic review and meta-analysis OR Review OR meta-analysis))	456
Web of Science	((Probiotic* OR Prebiotic* OR Synbiotic*) AND (Pregnancy OR Lactation OR Antepartum OR Prenatal OR Perinatal OR Postpartum) AND (Preeclampsia OR Hypertension disorders OR Gestational diabetes mellitus OR Premature rupture of membrane OR Mastitis OR Breast engorgement OR Mental disorder OR Psychosis OR Depression OR Anxiety OR Safety OR Pregnancy outcome OR Neonatal outcome OR Infection OR Preterm-labor OR Abortion OR Miscarriage) AND (Systematic review and meta-analysis OR Review OR meta-analysis))	380
Cochrane Library	((Probiotics) OR (Prebiotics)OR (synbiotics) OR (symbiotics)) AND ((Systematic review and meta-analysis) OR ("meta-analysis") OR (review)) AND ((Pregnancy) OR (lactation) OR (pregnancy outcome) OR (infant outcome))) in Title Abstract Keyword - (Word variations have been searched)	24
EMBASE	((Probiotics) OR (Prebiotics)OR (synbiotics) OR (symbiotics)) AND ((Systematic review and meta-analysis) OR ("meta-analysis") OR (review)) AND ((Pregnancy) OR (lactation) OR (pregnancy outcome) OR (infant outcome)))	554
Science Direct	((Probiotics OR Prebiotics OR Synbiotics) AND (Pregnancy OR Lactation) AND (Systematic review and meta-analysis OR Review OR meta-analysis))	928
Scopus	((probiotic* OR prebiotic* OR synbiotic*) AND (pregnancy OR lactation) AND (systematic AND review AND meta-analysis OR review OR meta-analysis))	240
Total		2582

Supplementary Table 3: Certainty of evidence included in the umbrella review using the GRADE system.

Review	Risk of bias	Inconsistency	Indirectness	Imprecision	Publication bias	Certainty
Othman, et al. 2007	Serious	Not applicable	No serious	No serious	Not reported	●●●○
Dugoua, et al. 2009	Not reported	No serious	No serious	No serious	Unlikely	●●●○
Han, et al. 2019	No serious	No serious	No serious	No serious	Unlikely	●●●●
Masulli et al. 2020	No serious	No serious	No serious	No serious	Likely	●●●○
Kuang, L., Y. 2020	No serious	No serious	No serious	No serious	Unlikely	●●●●
Moore, et al. 2020	No serious	Not applicable	No serious	No serious	Not applicable	●●●●
Desai, et al. 2021	No serious	No serious	No serious	No serious	Not done	●●●○
Pérez et al. 202	Serious	No serious	No serious	No serious	Unlikely	●●●○
Chen, et al. 2022	No serious	Serious	No serious	No serious	Likely	●○○○
Menichini, D. 2022	Serious	No serious	No serious	No serious	Unlikely	●●●○
Colquitt, et al. 2022	No serious	Not reported	No serious	Not reported	Likely	●○○○
Yu, et al. 2022	No serious	No serious	No serious	No serious	Not done	●●●○
Mahdizade et al. 2022	No serious	No serious	No serious	No serious	Likely	●●●○
Movaghar, R 2022	No serious	Serious	No serious	No serious	Not reported	●●●○
Martin, et al. 2022	No serious	Not applicable	No serious	No serious	Not applicable	●●●●
Halemani, et al. 2023	No serious	Serious	No serious	No serious	Not reported	●●●○
Bekalu et al 2023	No serious	Serious	No serious	No serious	Unlikely	●●●○

SRMA: Systematic Review and Meta-analysis; SR: Systematic Review; GDM: Gestational diabetes Mellitus; SBP: Systolic blood pressure; DBP: Diastolic blood pressure; MA: Meta-analysis; RoB: Risk of bias; NR: Not reported; ●●●● high; ●●●○ Moderate; ●○○○ Low.

Supplementary Table 5: Graphical crosstabulation to display the overlapping and selection of studies included in Group B Streptococcus theme.

	Jois, R. S. 2020	Menichini, D. 2022
Hanson et al 2014		
Ho et al 2016		
Ming-Ho, 2016		
Olsen et al 2018		
Azizet al 2018		
Sharpe et al., 2019		
Farr, 2020		

Supplementary Table 6: Graphical crosstabulation to display the overlapping and selection of studies included in the preeclampsia theme.

	Movaghar, R 2022
Kopp 2008	
Yuniati, 2013	
García-Ródenas, 2016	
Cabana 2017	
Hajifaraji 2 2018	

Supplementary Table 7: Graphical crosstabulation to display the overlapping and selection of studies included in the infant allergies theme.

	(Colquitt, et al. 2022)	(Yin, He et al. 2019)	(Kuang 2020)	(Doege, et al. 2012)	(Voigt 2022)	(Amalia, et al. 2020)
Kalliomäki et al 2001						
Rautava et al. 2002						
Kalliomäki et al. 2003						
Kukkonen et al. 2006						
Abrahamsson et al. 2007						
Kukkonen et al 2007						
Kalliomäki et al. 2007						
Huurre et al. 2008						
Bottcher 2008						
Kopp 2008						
Prescott 2008						
Wickens 2008						
Samanta et al 2008						
Hurreetal. 2008						
Niers 2009						
Soh 2009						
Kuitunen 2009						
West 2009						
Kim 2009						
Boyle et al. 2010						
Dotterud et al. 2010						
Kim 2010						
Wu Fuling, 2010						
Allen et al.2010						
Luoto et al. 2010						
Boyle 2011						
Ou 2012						
Rautava 2012						
Wickens 2012						
Jensen 2012						
Abrahamsson 2013						
Wickens 2013						
West 2013						
Benor et al. 2013						
Allen 2014						
Lindsay et al 2014						
Nomoto,et al.2014						
Bertelsen,et al. 2014						
Simpson et al. 2015						
Mastromarino et al. 2015						
Cabana 2017						
Wickens et al. 2017						
Peldan et al. 2017						
amm,et al.2017						
Wickens et al. 2018						
Davies,et al.2018						
Rautava et al. 2021						

Supplementary Table 8: Graphical crosstabulation to display the overlapping and selection of studies included in the lactation mastitis theme.

	(Barker, et al. 2020)	(Yu, et al. 2022)
Jime'nez et al. 2008		
Arroyo et al. 2010		
MaldonadoLobo'n et al. 2015		
Ferna'ndez et al. 2016		
Hurtado et al. 2017		
Jime'nez et al. 2021		

Supplementary Table 9: Graphical crosstabulation to display the overlapping and selection of studies included in the mental health theme.

	(Desai, et al. 2021)	(Trifkovič, et al. 2022)	(Halemani, et al. 2023)
Mi, 2015			
Mastromarino, 2015			
Mirghafourvand et al 2016			
Slykerman et al 2016			
Slykerman, 2017			
Korpela, 2018			
Okesene-Gafa et al. 2019			
Dawe et al. 2020			
Hulkkonen, 2021			
Browne, 2021			
Hulkkonen, 2022			
Yıldız Karaahme, 2022			

Supplementary Table 10: Graphical crosstabulation to display the overlapping and selection of studies included in the pregnancy outcome theme.

	(Othman, et al. 2007)	(Dugoua, et al. 2008)	(Grev, et al. 2017)	(Jarde, et al. 2018)	(Pérez et al. 2021)	Bekalu et al 2023
Neri 1993						
Kalliomaki 2001						
Rautava et al. 2002						
Nishijima 2005						
Gueimonde et al. 2006						
Kukkonen et al. 2006						
Abrahamsson 2007						
Kaplas et al. 2007						
Kukkonen et al. 2007						
Kopp 2008						
Bergmann, 2008						
Bababi et al 2008						
Wickens et al 2008						
Laitinen 2009						
Niers, 2009						
Kim, 2010						
Allen, 2010						
Dotterund 2010						
Luoto 2010						
Asemi 2011						
Boyle 2011						
Krauss-Silva 2011						
Ou 2012						
Rautava 2012						
Hantoushzadeh, 2012						
Taghizadeh et al 2013						
Lindsay 2014						
Benor 2014						
Lindsay 2015						
Dolatkah 2015						
Mastromarino 2015						
Okesene-Gafa 2016						
Fernández 2016						
Jacobsson 2016						
Mantaring 2016						
Karamali, 2016						
Jafarnejad 2016						
Ho 2016						
Ahmadi et al 2016						
Gille et al 2016						

Jamilian et al 2016						
Baldassarre 2016						
Dewanto et al 2017						
Wickens et al. 2017						
Vähämiko et al 2017						
Karamali 2018						
Badehnoosh 2018						
Mantaring et al 2018						
McMillan et al 2018						
Nabhani et al. 2018						
Okense-Gafa et al 2018						
Olsen et al. 2018						
Kijmanawa 2019						
Callaway 2019						
Asgharian et al.2019						
Chen et al 2019						
Jamilian et al 2019						
Pellonperä et. 2019						
Sahhaf et al 2019						
Sharpe et al. 2019						
Ali Pourmirzaiee et al 2020						
Halkjær et al. 2020						
Yang et al. 2020						
Pastor et al., 2020						
Karahmet 2022						

Supplementary Table 11: Graphical crosstabulation to display a study included in the safety theme with no overlap.

	(Dugoua, et al. 2009)
Kalliomäki et al. 2001	
Rautava et al. 2002	
Nishijima et al. 2005	
Gueimonde et al.2006	
Kukkonen et al. 2006	
Abrahams son et al. 2007	
Kaplas et al. 2007	
Kukkonen et al. 2007	

Supplementary Table 12: Graphical crosstabulation to display the overlapping and selection of studies included in the bacterial transfer to infant theme.

	(Moore, et al. 2020)	(Martin et al. 2022)	bekalu et al 2023
Lahtinen et al 2009			
Abrahamsson et al, 2009			
Grzeskowiak L et al 2012			
Yuniati, 2013			
Enomoto T 2014			
Dotterud et al 2015			
Rutten et al 2015			
Mastromarino, 2015			
Baglatzi, 2016			
Cooper, 2016			
García-Ródenas, 2016			
Bazanella, 2017			
Chien Chua, 2017			
Frese, 2017			
Korpela, 2018			
Hurkala, 2020			
Pastor-V et al, 2020			
Estorninos, 2021			
Phavichitr, 2021			

