



RESEARCH ARTICLE

REVISED Mid-level health providers for primary healthcare: a rapid evidence synthesis [version 2; peer review: 2 approved]

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v2 First published: 16 Jun 2020, 9:616
<https://doi.org/10.12688/f1000research.24279.1>

Latest published: 10 May 2021, 9:616
<https://doi.org/10.12688/f1000research.24279.2>

Abstract

Background: Healthcare services, in many countries, are increasingly being provided by cadres not trained as physicians, and these substitute health workers are referred to as mid-level health providers (MLHPs). The objective of this study was to rapidly synthesise evidence on the effectiveness of MLHPs involved in the delivery of healthcare, with a perspective on low- and middle-income countries.

Methods: The review team performed an overview of systematic reviews assessing various outcomes for participants receiving care from MLHPs. The team evaluated systematic reviews for methodological quality and certainty of the evidence. Also, the review team consulted relevant stakeholders in India.

Results: The final report included seven systematic reviews, with six assessed as moderate to high methodological quality. Mortality outcomes concerning pregnancy and childbirth care services showed no significant differences in care provided by MLHPs when compared with doctors. Pregnancy care provided by midwives was found to improve the quality of care slightly. The risk of failure or incomplete abortion for surgical abortion procedures provided by MLHPs was twice when compared to the procedures provided by doctors. Moderate to high certainty evidence showed that initiation and maintenance of antiretroviral therapy for HIV-infected patients by a nurse or clinical officer slightly reduced mortality. High certainty evidence showed that chronic disease management by non-medical prescribers reduced some important physiological measures compared to medical prescribing by doctors.

Conclusions: To date, this is the first rapid overview of the evidence on MLHPs. Low-quality evidence suggests that MLHPs might be suitable to deliver quality pregnancy care. Moderate and high-quality evidence from trials suggests that MLHPs are helpful for chronic disease management and initiation and maintenance of antiretroviral therapy in people with HIV/AIDS. However, the roles and subsequent training and regulation of MLHPs might be different for different care domains.

Open Peer Review

Reviewer Status

	Invited Reviewers	
	1	2
version 2 (revision) 10 May 2021		 report
version 1 16 Jun 2020	 report	 report

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Any reports and responses or comments on the article can be found at the end of the article.

Keywords

Rapid review, rapid evidence synthesis, systematic reviews, mid-level health providers, MLHPs, low- and middle-income countries

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Author roles: **Moola S:** Data Curation, Formal Analysis, Methodology, Writing – Original Draft Preparation, Writing – Review & Editing; **Bhaumik S:** Conceptualization, Methodology, Validation, Writing – Review & Editing; **Nambiar D:** Conceptualization, Validation, Writing – Review & Editing

Competing interests: No competing interests were disclosed.

Grant information: This gratis rapid evidence synthesis was made possible due to the support from World Health Organization, Alliance for Health Policy and Systems Research [2019/882302-4].

The funders had no role in study design, data collection and analysis, decision to publish, or preparation of the manuscript.

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How to cite this article: Moola S, Bhaumik S and Nambiar D. **Mid-level health providers for primary healthcare: a rapid evidence synthesis [version 2; peer review: 2 approved]** F1000Research 2021, 9:616 <https://doi.org/10.12688/f1000research.24279.2>

First published: 16 Jun 2020, 9:616 <https://doi.org/10.12688/f1000research.24279.1>

REVISED Amendments from Version 1

Major differences between the previously published version and the new version of the article relate to the abstract and the discussion sections. The changes in the discussion relation were about the context, the comparison of similar or contrasting review findings with existing literature available on the topic. The new version also includes additional citations to support the additional information. The revised abstract reflects the changes done in the main text. There were some minor changes in the introduction and methods section in the revised version, mainly concerning the context of the review and information on stakeholder engagement.

Any further responses from the reviewers can be found at the end of the article

Introduction

There is a growing momentum worldwide to improve access to healthcare and provide efficient and cost-effective primary healthcare (PHC)¹. Mid-level health providers (MLHPs) are currently being used in high- and low-income countries to assist doctors and specialists or render services independently, particularly in resource-poor settings, to make up for the scarcity of health professionals. Countries with poor economies and weak healthcare infrastructure have inadequate human resources for health. There is a growing movement for countries to strengthen and initiate the use of MLHWs to increase access to services¹. However, MLHPs have been used for many years in Africa and Asia^{1, p.9}. Their role has been progressively expanding and receiving attention, particularly in low- and middle-income countries (LMICs), as a strategy to overcome health workforce challenges and improve access to essential health services¹.

A cornerstone of India's current health systems reform efforts is the flagship *Ayushman Bharat* (AB) program. Primarily, the program has an insurance component (Pradhan Mantri Jan Arogya Yojana, PMJAY) and the development of Health and Wellness Centres (HWCs) as strategies to advance on the path to universal health coverage².

Ayushman Bharat's HWC sub-strategy, the comprehensive primary healthcare (CPHC), conceives MLHPs as a key focal point for service organisation and delivery, performing a range of screening, diagnostic and clinical functions and improve health systems at the frontline. The program conceptualises 12 different packages for the CPHC reforms³. One key pillar of rolling out the AB-HWC component is implementing a new health cadre trained and accredited for a set of skills/competencies related to PHC and public health. Further, one of this programme's aims is the transformation of existing sub-health centres and PHCs to HWCs, with teams led by MLHPs.

The National Health Systems Resource Centre (NHSRC), the technical support agency of the National Health Mission, is responsible for developing the curriculum for MLHPs. We received a request from the NHSRC for a rapid review of evidence on the effectiveness of MLHPs in the PHC context of low- and

middle-income countries (LMICs) to understand the role MLHPs can play in different packages. We host a rapid evidence synthesis (RES) platform, which provides RES products in various formats to public agencies. RES or rapid review is an emerging form of evidence synthesis that is increasingly being promoted by the WHO and employed by governments to inform decision making⁴. The need to meet the time-sensitive demands and the availability of fewer resources necessitated a RES. We thus synthesised evidence related to the effectiveness of MLHPs in the PHC context of LMICs.

Methods

Approach for RES

We conducted a rapid overview of systematic reviews (SRs) of evidence on the effectiveness of MLHPs within a span of about eight weeks and in all domains corresponding to the CPHC package in *Ayushman Bharat*. The 12 CPHC packages are: pregnancy and childbirth; neonatal and infant health services; childhood and adolescent health services; family planning, contraceptive services and other reproductive care services; communicable diseases (prevention and management); non-communicable diseases; elderly and palliative care; oral healthcare; ophthalmic and ear, nose and throat (ENT) care; mental health and emergency medical services³.

The World Health Organization (WHO), defined MLHP as "a health provider who is trained, authorised and regulated to work autonomously, receives pre-service training at a higher education institution for at least 2–3 years and whose scope of practice includes (but is not restricted to) being able to diagnose, manage and treat illness, disease, and impairments (including performing surgery, where appropriately trained), prescribe medicines, as well as engage in preventive and promotive care"^{1, p.8}. However, MLHPs in various countries have been variously referred to as substitute health workers, auxiliaries, non-physician clinicians, and include cadres such as clinical officers, medical assistants, physician assistants, nurse practitioners, and surgical technicians. Institutions and researchers worldwide use alternate or less well-specified definitions, and therefore MLHP as defined in the SRs was considered for this review. Therefore, we used broad criteria for the rapid overview wherein we accepted the definition of MLHPs as defined by the SR authors. The overview of SRs is an appropriate study design for our research because we intended to summarise the evidence for multiple conditions in different disease/condition domains for the same type of intervention and on similar health systems, clinical and public health outcomes.

Inclusion criteria

Participants. The RES considered SRs assessing outcomes for participants receiving care from MLHPs in LMICs, including India.

Intervention and comparators. SRs that compared service delivery provided by MLHPs with doctors or other types of MLHPs were included. The MLHPs included were midwives, nurses, auxiliary nurses, nurse assistants, non-physician clinicians, and surgical technicians.

Outcomes. The following outcomes were considered for inclusion based on the initial discussions with the requester: healthcare and clinical outcomes (mortality, morbidity, outcomes associated with care delivery, and physiological measures); access to care; and quality of care (including patient or client satisfaction with care).

Study design. SRs including studies of any quantitative study design, irrespective of whether they have or have not conducted meta-analyses and irrespective of whether they have or have not used the Grading of Recommendations Assessment, Development and Evaluation (GRADE) framework to assess the certainty of evidence were included. Qualitative SRs were not considered.

Context. The review considered SRs with a focus on and including studies from LMICs. SRs that included studies conducted in both HICs and LMICs were considered for inclusion, with no pre-specified criteria for the percentage of studies included from LMICs.

Stakeholder engagement. As part of the RES process, the review team and NHSRC jointly convened a policy dialogue to consult with relevant stakeholders on an interim draft of the MLHP policy brief. The final draft of the policy brief incorporated feedback from the consultation. The stakeholders included key stakeholders, including policymakers, health system managers and researchers.

Search strategy

Given time constraints, the search was limited to published and indexed articles, and those published in the English language. The following databases were searched (from database inception up until March 2019): Cochrane Database of Systematic Reviews; Medline (PubMed); EMBASE; Health Systems Evidence; and CINAHL. An additional search was conducted from April 2019 to April 2020 to update the review findings for recency and relevancy. Search strategies (for both the periods) are provided separately for each database (see *Extended data*)⁵.

Data collection and analysis

The lead reviewer (SM) independently screened the titles and abstracts of studies for inclusion, following which full-text examination of eligible studies was conducted for potential inclusion. A second reviewer (SB) randomly verified the results of the study selection process during both the screening stages. For each domain of interest, where multiple SRs were available, only one SR was included based on its comprehensiveness, recency, and quality. Each SR was independently assessed for methodological quality by using established standardised criteria (A Measurement Tool to Assess systematic Reviews (AMSTAR) 2 checklist)⁶. Data from included reviews was extracted using a pre-defined template, which included variables such as review type, review question, countries/settings, participants characteristics, interventions, outcome measures and review conclusions. The lead author (SM) independently extracted all relevant outcome data, with random verification of 20% of the included studies by another author (SB).

Summary of findings

The GRADE approach was used to assess the certainty of the evidence using a transparent framework for developing and presenting the summary of findings tables⁷⁻¹⁰. The GRADE of evidence was synthesised with respect to a PHC setting and in an LMIC context to make the product locally relevant^{9,10}.

Stakeholder engagement

As part of the RES process, the RES team and NHSRC jointly convened a policy dialogue to engage and consult with relevant stakeholders to present an interim draft of the MLHP policy brief. The stakeholders included policy makers (key stakeholders from government agencies and collaborators), health system managers, and researchers from more than eight states in India.

Results

Search results and study selection

The search for evidence identified 5171 studies (Figure 1 – Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) flow diagram). Following the study screening process, full-text articles were retrieved for 30 potentially relevant studies. In cases where there were multiple SRs for the same domain, the SR that was the most recent and provided comprehensive information (as per authors' (SM, SB) consensus) was selected and included. Following full-text examination, 23 out of 30 SRs were excluded. An additional 717 records were identified in an updated search. However, following the study selection process, none of the reviews were found to be relevant to the topic of interest (Figure 2 – PRISMA flow diagram (updated search)). Overall, seven SRs were included in the RES.

Characteristics of included SRs

The majority of the studies included in the SRs were randomised controlled trials (RCTs), with some quasi-experimental study designs and observational studies. Key characteristics of the included SRs are provided in the *Extended data* file⁵. The studies related to HIV/AIDS were mostly conducted in sub-Saharan African countries^{11,12}. Most studies compared care provided by midwives or auxiliary nurse midwives or nurses with that provided by doctors working in a team along with midwives or nurses.

Methodological quality of included SRs

The AMSTAR-2 checklist⁶ was used to assess the methodological quality of SRs included in the report. The checklist is a 16-item questionnaire. The critical appraisal results of the included SRs are provided in the *Extended data* file⁵. Six out of seven SRs were of moderate to high methodological quality and well reported. Almost all the SRs did not refer to a *a priori* protocol and publication bias was not assessed. One SR by Chaudhary *et al.* was of poor quality, as assessed by the checklist¹¹.

Summary of findings tables for each domain of interest

Key findings. The key findings from the included SRs have been categorised based on the various healthcare domains of interest in the CPHC package³. The quality of evidence for the main outcomes is summarised using the GRADE approach and

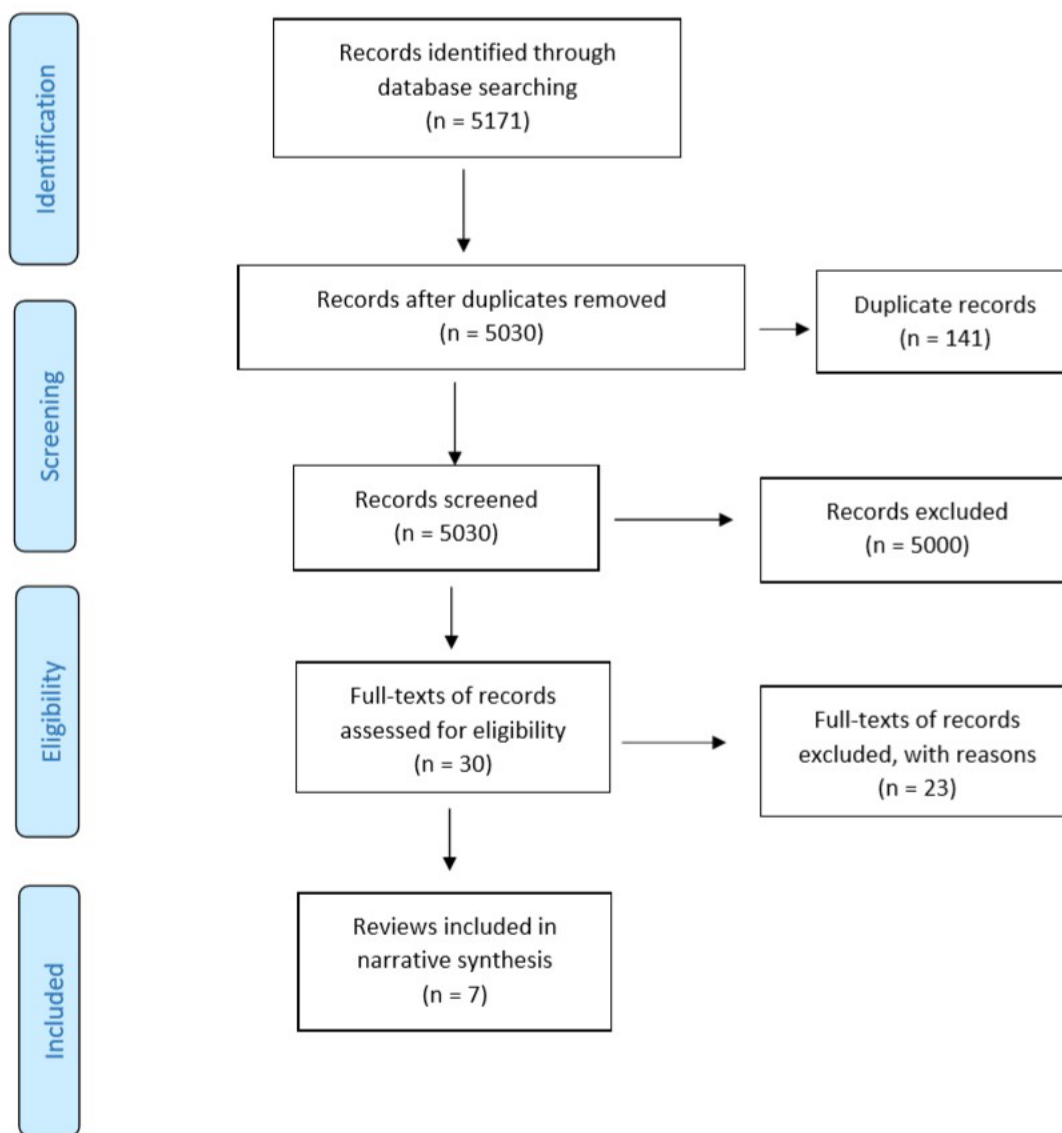


Figure 1. PRISMA study flow diagram. Search conducted from database/s inception up until March 2019.

‘Summary of Findings’ tables⁷⁻¹⁰. The Summary of Findings tables aid in recording results, outcomes, and outcome risks in a structured synthesis format.

MLHPs for care in pregnancy and childbirth. An SR compared the effectiveness of care provided by MLHPs, particularly midwives and auxiliary nurse midwives with doctors providing care in a team with midwives¹³. The review included patients receiving pregnancy and childbirth services including antenatal care. The majority of the studies were conducted in tertiary care settings and developed countries. Most of the evidence was assessed as low certainty. It was found that the use of intrapartum analgesia and episiotomies were less likely with care provided by midwives when compared with that provided

by doctors working along with midwives. Also, no significant difference in rates for performing caesarean section, postpartum haemorrhage, and preterm births were reported.

No significant difference in the likelihood of an incomplete abortion was reported between groups of patients treated by auxiliary nurse midwives compared to those cared for by doctors. However, the likelihood of a complication during or an adverse event after manual vacuum aspiration was significantly greater with care provided by auxiliary nurse midwives. There was very low certainty evidence to suggest that pregnancy care provided by clinical officers reduced the likelihood of early neonatal death or postoperative maternal health outcomes, such as fever and wound infections. [Table 1](#) provides a summary

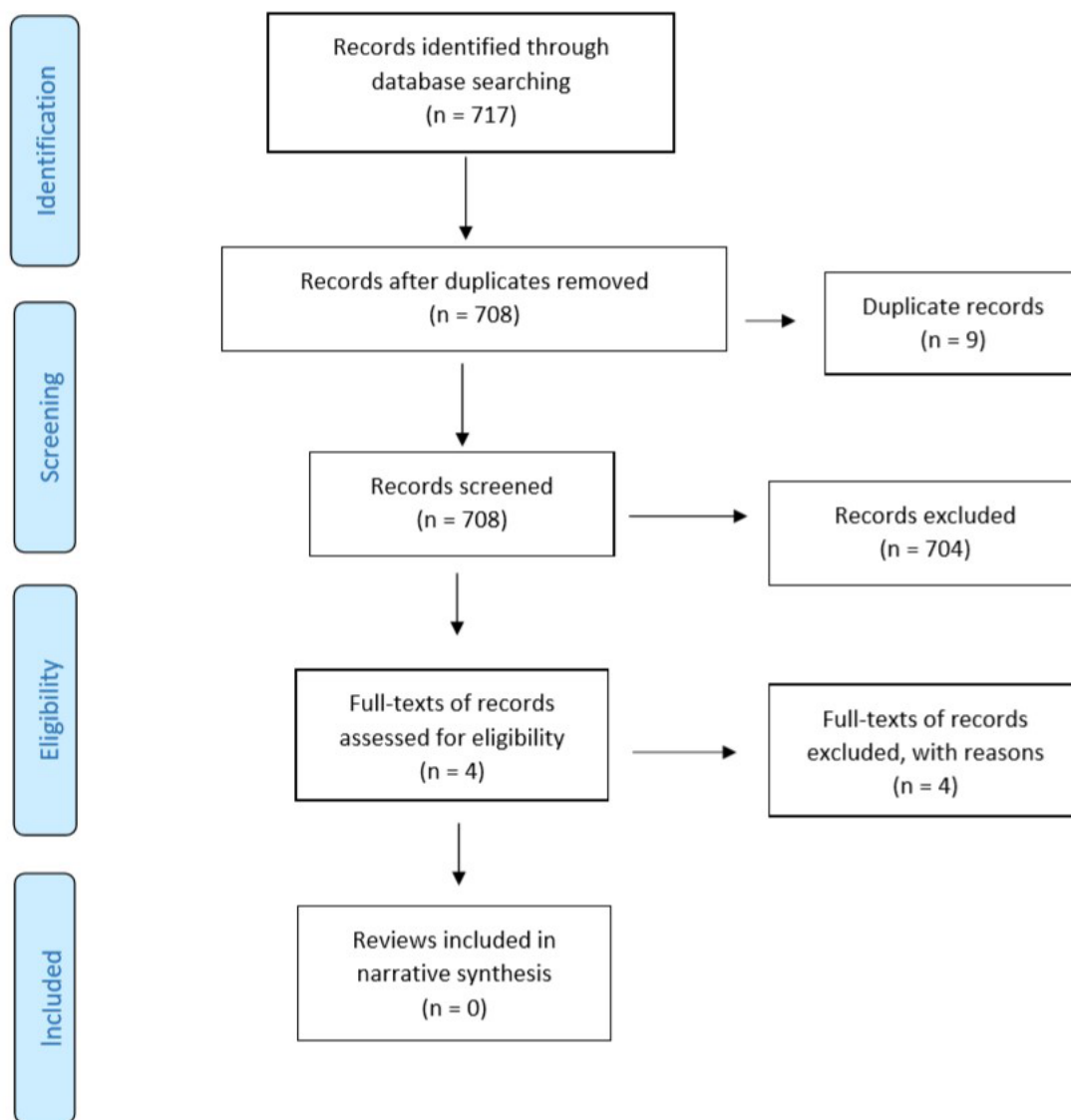


Figure 2. PRISMA study flow diagram (updated search). Updated search from April 2019 to April 2020.

of findings and certainty of evidence related to pregnancy and childbirth care provided by midwives, auxiliary nurse midwives and clinical officers with that provided by doctors in a team with midwives.

MLHPs for neonatal and infant health care services. The effectiveness of midwives/nurses delivering care for neonatal and infant healthcare services was compared with that provided by doctors or obstetricians in a team with midwives in a SR¹³. The population included patients receiving neonatal and infant health services. The majority of the studies were conducted in tertiary care settings and developed countries. The certainty of the evidence was assessed as low quality. The review results showed that there was no significant difference between the

groups in foetal or neonatal death rates. None of the studies included in the review reported on clinical outcomes, and outcomes related to quality of care and access to care. **Table 2** presents the review findings in plain language format and the certainty of the evidence for the relevant outcome.

MLHPs for family planning, contraceptive and other reproductive health care services. Another SR by Barnard *et al.* evaluated the safety and effectiveness of surgical and medical abortion procedures administered by MLHPs compared to doctors¹⁴. The review included various MLHPs who included nurses, midwives, doctor assistants, and physician assistants delivering care for patients requesting abortion procedures, either surgical or medical. The majority of the studies were

Table 1. Summary of findings for care provided by MLHPs for pregnancy and childbirth.

	Outcomes	Relative effect (95% CI)	No of participants	Certainty of the evidence (GRADE)	Plain language summary
Midwives alone versus doctors along with midwives					
Randomised Controlled Trials (RCTs)	Rate of performing caesarean sections	RR 0.94 (0.81 to 1.06)	12144 (8 RCTs)	⊕⊕○○ Low ¹	Pregnancy care provided by midwives may slightly reduce the rate of performing caesarean sections (low certainty evidence)
	Postpartum haemorrhage	RR 0.53 (0.25 to 1.14)	8604 (6 RCTs)	⊕⊕○○ Low ^{1,2}	Pregnancy care provided by midwives may reduce postpartum haemorrhage (low certainty evidence)
	Preterm births	RR 0.87 (0.73 to 1.04)	9210 (5 RCTs)	⊕⊕○○ Low ¹	Pregnancy care provided by midwives may slightly reduce preterm births (low certainty evidence)
	Use of intrapartum regional analgesia	RR 0.87 (0.81 to 0.93)	9415 (8 RCTs)	⊕⊕○○ Low ¹	Pregnancy care provided by midwives may slightly reduce the use of intrapartum regional analgesia (low certainty evidence)
	Episiotomies	RR 0.85 (0.78 to 0.92)	13205 (8 RCTs)	⊕⊕○○ Low ¹	Pregnancy care provided by midwives alone may slightly reduce in episiotomies (low certainty evidence)
	Quality of care (QoC)	RR 1.23 (1.10 to 1.37)	826 (1 RCT)	⊕⊕○○ Low ^{1,3}	Pregnancy care provided by midwives may slightly improve quality of care (low certainty evidence)
	Mortality and Access to care	-	-	-	No studies were found that examined these outcomes
Auxiliary nurse midwives versus doctors					
RCTs	Incomplete abortion	RR 0.93 (0.45 to 1.90)	1032 (1 RCT)	⊕⊕○○ Low ^{1,3}	Pregnancy care provided by auxiliary nurse midwives may make little or no difference in the likelihood of an incomplete abortion (low certainty evidence)
	Complications during conduct of manual vacuum aspiration	RR 3.07 (0.16 to 59.1)	2789 (1 RCT)	⊕⊕○○ Low ^{1,3}	Pregnancy care provided by auxiliary nurse midwives may make little or no difference in complications during manual vacuum aspiration. However, the wide 95% confidence interval includes the possibility of both increased and reduced complications (low certainty evidence)
	Post-operative adverse event	RR 1.36 (0.54 to 3.40)	2761 (1 RCT)	⊕⊕○○ Low ^{1,3}	Pregnancy care provided by auxiliary nurse midwives may increase post-operative adverse events; however, the 95% confidence interval includes the possibility of both increased and reduced postoperative adverse events (low certainty evidence)
Clinical officers versus doctors					

	Outcomes	Relative effect (95% CI)	No of participants	Certainty of the evidence (GRADE)	Plain language summary
Observational studies	Likelihood of early neonatal death	RR 1.40 (0.51 to 3.87)	(1 observational study)	⊕○○○ Very low ⁴	It is uncertain whether pregnancy care provided by clinical officers reduces the likelihood of early neonatal death as the certainty of the evidence has been assessed to be very low
	Postoperative maternal health outcomes, such as fever, wound infection, the need for re-operation and maternal death, after emergency obstetric procedures	RR 0.99 (0.95 to 1.03)	(1 observational study)	⊕○○○ Very low ⁴	It is uncertain whether pregnancy care provided by clinical officers reduces the effect on postoperative maternal health outcomes as the certainty of the evidence was assessed to be very low

¹Downgraded one level due to serious risk of bias and another two levels due to indirectness (almost all the studies were conducted in tertiary care centres and high-income countries).

²Downgraded one level due to serious inconsistency (considerable heterogeneity was found).

³Downgraded one level due to imprecision (single study with a small sample size yielding wide confidence intervals spanning line of no effect).

⁴Quality of evidence was downgraded from Low (observational study design) to Very low due to a very serious risk of bias.

CI, confidence interval; GRADE, Grading of Recommendations, Assessment, Development and Evaluations; RR, risk ratio; RCT, randomised controlled trial; QoC, quality of care; MLHPs, mid-level health providers.

Table 2. Summary of findings for care provided by MLHPs for neonatal and infant health care services.

	Outcomes	Relative effect (95% CI)	No of participants	Certainty of the evidence (GRADE)	Plain language summary
Midwives versus obstetrician or doctor in team with midwives					
RCTs	Foetal or neonatal death	RR 0.94 (0.56 to 1.58)	11562 (6 RCTs)	⊕⊕○○ Low ¹	Care provided by midwives alone may result in little to no difference in foetal or neonatal deaths (low certainty evidence)
	Clinical outcomes; quality of care & access to care	-	-	-	No studies were found that examined these outcomes

¹Downgraded one level due to serious risk of bias and two levels due to indirectness (almost all the studies were conducted in tertiary care centres).

CI, confidence interval; GRADE, Grading of Recommendations, Assessment, Development and Evaluations; RR, risk ratio; RCT, randomised controlled trial; MLHPs, mid-level health providers.

conducted in PHC settings and LMICs. Much of the evidence was of low or very low quality. The review found that the evidence for surgical abortion procedures provided by MLHPs was lacking. Further, evidence from cohort studies suggested that there was an increase in the risk of failure or incomplete abortion for surgical abortion procedures when provided by MLHPs. However, no statistically significant differences in complications alone, immediate complications or delayed complications were reported when surgical abortion was

provided by MLHPs. Concerning medical abortion procedures, the review results suggested MLHPs could safely and effectively carry out these procedures. No significant differences were reported for abortion failure or incomplete abortion. None of the studies included in the SR examined other outcomes of interest such as mortality, quality of care, and access to care. Table 3 presents a summary of findings on various outcomes related to surgical and medical abortion procedures provided by MLHPs compared to doctors.

Table 3. Summary of findings for care provided by MLHPs for family planning, contraceptive and other reproductive health care services.

	Outcomes	Relative effect (95% CI)	No of participants	Certainty of the evidence (GRADE)	Plain language summary
Nurses, midwives, doctor assistants, and physician assistants versus doctors					
Surgical abortion procedures					
RCTs	Failure/incomplete abortion	RR 2.97 (0.21 to 41.82)	2789 (2 RCTs)	⊕⊕○○ Low ¹	Care provided by MLHPs may increase the chance of the abortion being ineffective or incomplete (more than twice the risk of failure or incomplete abortion for surgical abortion procedures provided by MLHPs when compared to the procedures provided by doctors) (low certainty evidence)
	Complications	RR 0.99 (0.17 to 5.7)	2789 (2 RCTs)	⊕⊕○○ Low ¹	Care provided by MLHPs may make little or no difference in complications (low certainty evidence)
	Total complications*	RR 3.07 (0.16 to 59.08)	2789 (2 RCTs)	⊕⊕○○ Low ¹	Care provided by MLHPs may increase total complications. However, the wide 95% confidence interval includes the possibility of both increased and reduced risk of total complications (low certainty evidence)
Observational studies	Failure/incomplete abortion	RR 2.2 (1.34 to 3.6)	13,715 (3 observational studies)	⊕○○○ Very low ^{1,2}	It is uncertain as to whether care provided by MLHPs reduces the risk of failure of incomplete abortion as the certainty of the evidence has been assessed as very low
	Complications	RR 1.38 (0.7 to 2.72)	13,715 (3 observational studies)	⊕○○○ Very low ¹⁻³	It is very uncertain whether care provided by MLHPs reduces complications as the certainty of the evidence has been assessed as very low
	Total complications*	RR 1.36 (0.86 to 2.14)	16,173 (4 observational studies)	⊕○○○ Very low ¹⁻³	It is very uncertain about the effect of care provided by MLHPs on the risk of total complications.
	Mortality; quality of care; and access to care	-	-	-	No studies were found that examined these outcomes
Medical abortion procedures					
RCTs	Failure/ incomplete abortion	RR 0.81 (0.48 to 1.36)	1892 (2RCTs)	⊕⊕⊕○ Moderate	Care provided by MLHPs may slightly reduce the risk of failure/ incomplete medical abortion when compared with that provided by doctors (moderate certainty evidence)

	Outcomes	Relative effect (95% CI)	No of participants	Certainty of the evidence (GRADE)	Plain language summary
Observational studies	Failure/incomplete abortion	RR 1.09 (0.63 to 1.88)	1164 (1 study)	⊕○○○ Very low ¹⁻³	It is very uncertain about the effect of care provided by MLHPs on failure/incomplete abortion as the quality/certainty of the evidence has been assessed as very low
	Mortality; quality of care; and access to care	-	-	-	No studies were found that examined these outcomes

*Total complications - incomplete or failed abortion and complications

¹Downgraded one level due to imprecision and additional one level due to indirectness as studies included were not from the primary healthcare context.

²Downgraded two levels due to risk of bias and one level for imprecision (wide confidence intervals)

³Downgraded one level due to serious risk of bias

CI, confidence interval; GRADE, Grading of Recommendations, Assessment, Development and Evaluations; RR, risk ratio; RCT, randomised controlled trial; MLHPs, mid-level health providers.

MLHPs for communicable diseases. Two SRs examined the effectiveness of the delivery of antiretroviral therapy (ART) provided by MLHPs in HIV-infected patients^{11,12}. The reviews included studies mainly conducted in primary healthcare settings and LMICs. The studies included in the reviews compared ART provided by nurses or clinical officers with doctors. The certainty of the evidence varied for different outcomes, from high to very low quality. However, the evidence for various outcomes was based on relatively few studies. The review reported that there was no significant difference in mortality, with lower rates of losses to follow up at 12 months. Further, no difference in death or number of patients lost to follow up at 12 months was reported when doctors initiated therapy and nurses provided follow-up. The reviews suggested that shifting tasks from doctors to MLHPs may help in potentially reducing costs of ART provision, without compromising on the quality of care and patient outcomes. [Table 4](#) provides a summary of findings reported in the SRs for outcomes related to the initiation and maintenance of ART in HIV-infected patients.

MLHPs for non-communicable diseases. Two reviews compared the effectiveness of care provided by non-physician health workers (NPHWs) for patients with non-communicable diseases in primary and secondary healthcare settings^{15,16}. The NPHWs included nurses, pharmacists, allied health professionals, and physician assistants. The care provided by NPHWs was compared to that provided by doctors for various

physiological measure outcomes, health-related quality of life, and access to care. The evidence assessed was of moderate to high quality. The findings from the two reviews suggested that care provided by NPHWs with varying but high degrees of autonomy and with support was comparable to that provided by doctors for various relevant outcomes. Care prescription by NPHWs significantly improved outcomes such as systolic blood pressure, glycated haemoglobin and low-density lipoprotein levels. Also, the care provided by NPHWs improved health-related quality of life (physical component). However, the mental health-related quality of life was reduced with the care provided by NPHWs compared to that provided by doctors. There was a lack of conclusive evidence on outcomes related to access to care. [Table 5](#) presents a summary of findings for various relevant outcomes related to chronic diseases.

MLHPs for mental health. One SR compared the effectiveness of delivery of care provided by non-specialist health workers (NSHWs) to that provided by mental health specialists in women with perinatal depression¹⁷. The NSHWs included midwives, nurses, and community health workers. The studies included in the review were conducted in primary health settings and LMICs. The review found that the NSHWs could effectively deliver psychological interventions for perinatal depression in low-resource settings, particularly where specialist services are both scarce and expensive. The review did not examine other relevant outcomes such as mortality, quality of care, and access to care. The review lacked proper reporting and hence

Table 4. Summary of findings for care provided by MLHPs for HIV/AIDS and ART.

	Outcomes	Relative effect (95% CI)	No of participants	Certainty of the evidence (GRADE)	Plain language summary
Nurses or clinical officers versus doctors					
RCTs	Initiation and maintenance of ART mortality follow-up: 12 months	RR 0.96 (0.82 to 1.12)	2770 (1 RCT)	⊕⊕⊕⊕ High	Initiation and maintenance of ART by a nurse or a clinical officer slightly reduces mortality (high certainty evidence)
	Maintenance of ART death follow-up: 12 months	RR 0.89 (0.59 to 1.32)	4332 (2 RCTs)	⊕⊕⊕○ Moderate ¹	Maintenance of ART by a nurse or a clinical officer makes little or no difference in mortality when ART had previously been initiated by a doctor (moderate quality/certainty evidence)
Observational studies	Initiation and maintenance of ART death follow-up: 12 months	RR 1.23 (1.14 to 1.33)	39160 (2 observational studies)	⊕⊕○○ Low ²	Evidence suggests that there may be an increased risk of death when ART is initiated and maintained by a nurse or a clinical officer when compared to a doctor's care (low certainty evidence)
	Maintenance of ART death follow-up: 12 months	RR 0.19 (0.05 to 0.78)	2772 (1 study)	⊕○○○ Very low ³	It is uncertain whether nurse-led care reduced mortality as the quality/certainty of the evidence has been assessed as very low
	Quality of care and access to care	-	-	-	No studies were found that examined these outcomes

¹ Downgraded by one level for imprecision due to a wide confidence interval

² Rated low because of observational study designs. Not downgraded for risk of bias

³ Downgraded by one level for imprecision due to low event numbers

CI, confidence interval; GRADE, Grading of Recommendations, Assessment, Development and Evaluations; RR, risk ratio; RCT, randomised controlled trial; MLHPs, mid-level health providers; HIV, human immunodeficiency virus; AIDS, acquired immunodeficiency syndrome; ART, antiretroviral therapy.

it was not possible to assess the certainty of evidence by GRADE. The SR included nine RCTs involving a total of 14,555 participants. **Table 6** briefly presents a narrative summary of the findings reported in the review.

MLHPs for other packages of care. This RES did not identify any SRs that assessed the role of MLHPs in the provision of following health services.

- MLHPs for childhood and adolescent health services
- MLHPs for ophthalmic and ENT conditions
- MLHPs for elderly and palliative healthcare
- MLHPs for emergency medical services

Discussion

In this rapid overview of SRs, we examined the evidence on the effectiveness of care provided by MLHPs in LMICs for various healthcare domains of India's CPHC package³. We contextualised the certainty using the GRADE approach⁷. We found that there is some evidence that MLHP-led care may be appropriate in patients for management of various outcomes in different healthcare domains of interest such as maternal and child health, neonatal and infant health, and communicable and non-communicable disease management when compared to a physician or doctor-led care. Still, the certainty of the evidence for this was mostly low or moderate (barring a few exceptions). As such, while MLHPs can be considered as an alternative to medical professionals for some domains, the

Table 5. Summary of findings for care provided by NPHWs for non-communicable disease management.

	Outcomes	Mean difference (MD) (95% CI)	No of participants	Certainty of the evidence (GRADE)	Plain language summary
Non-medical (non-physician health workers (NPHWs)) prescribing compared to medical (doctors) prescribing for chronic disease management in primary care					
RCTs	Systolic blood pressure (mmHg) at 12 months	MD -5.31 mmHg lower (-6.46 to -4.16 lower)	4229 (12 RCTs)	⊕⊕⊕⊕ High	Chronic disease management by non-medical prescribers probably reduces systolic blood pressure (high certainty evidence)
	Glycated haemoglobin (HbA1c, %) at 12 months	MD -0.62 (-0.85 to -0.38)	775 (6 RCTs)	⊕⊕⊕⊕ High	Chronic disease management by non-medical prescribers reduces the glycated haemoglobin levels (high certainty evidence)
	Low-density lipoprotein (mmol/L) at 12 months	MD -0.21 (-0.29 to -0.14)	1469 (7 RCTs)	⊕⊕⊕○ Moderate ¹	Chronic disease management by non-medical prescribers probably reduces low-density lipoprotein levels (moderate certainty evidence)
	Health-related quality of life measured with SF-12/36 – Physical component	MD 1.17 (0.16 to 2.17)	2385 (8 RCTs)	⊕⊕⊕○ Moderate ²	Chronic disease management by non-medical prescribers probably improves the health-related quality of life (moderate certainty evidence)
	Health-related quality of life measured with SF-12/36 – Mental component	MD 0.58 (-0.40 to 1.55)	2246 (6 RCTs)	⊕⊕⊕○ Moderate ^{1,2}	Chronic disease management by non-medical prescribers probably reduces health-related quality of life (mental component) (moderate certainty evidence)
	Mortality	-	-	-	No studies were found that examined this outcome
	Access to care	-	-	-	Several studies reported improved access to healthcare at the community level, although the metric to evaluate access was often not described. Data was not reported, and the evidence was not assessed according to GRADE criteria.

¹Downgraded one level due to serious inconsistency (considerable heterogeneity was found)

²Downgraded one level due to indirectness (prescribing component effect on quality of life difficult to determine)

CI, confidence interval; GRADE, Grading of Recommendations, Assessment, Development and Evaluations; MD, mean difference; RCT, randomised controlled trial; NPHW, non-physician health worker.

Table 6. Summary of findings for care provided by NSHWs for women with perinatal depression.

Outcomes	Impact	Plain language summary
Non-specialist health workers (NSHWs) (midwives, nurses and community health workers) versus mental health specialists		
Perinatal depression assessed using Edinburgh Postnatal Depression Scale (EPDS), the Center for Epidemiological Studies Depression Scale (CES-D), Beck Depression Inventory (BDI), the General Health Questionnaire (GHQ), Hamilton Depression Rating Scale (HDRS) Follow up: range 6 weeks to 3 years	All nine studies reported statistically significant improvements in perinatal depression in the intervention groups compared with control groups. The estimates were presented differently for different measurement scales and at different followup periods.	Only narrative synthesis was conducted for the systematic review and no pooled estimate was available. The results suggested that NSHWs can feasibly provide mental health services leading to improvement in perinatal depression scores, particularly in low-resource settings where specialist services are both scarce and expensive. Certainty of evidence by GRADE was not assessed for it due to the paucity of information in the published SR.
Mortality; quality of care and access to care	-	No studies were found that examined these outcomes

NSHW, non-specialist health worker; EPDS, Edinburgh Postnatal Depression Scale; CES-D, Center for Epidemiological Studies Depression Scale; BDI, Beck Depression Inventory; GHQ, General Health Questionnaire; HDRS, Hamilton Depression Rating Scale; GRADE, Grading of Recommendations, Assessment, Development and Evaluations; SR, systematic review.

certainty of evidence implies the need for building an evidence base and careful evaluation of programs.

Low-quality evidence suggests that MLHPs might be suitable to deliver quality pregnancy care. In their review¹⁸, indicated that shifting tasks or sharing them with MLHPs could lead to increased service provision and improved patient outcomes in the provision of emergency obstetric care and family planning services. Studies from India and Nepal suggest that MLHPs found task-shifting of medical abortion provision to mid-level providers to be acceptable, and women were happy with the service provided^{19,20}. Moderate and high-quality evidence from trials suggests that MLHPs are helpful for chronic disease management and initiation and maintenance of ART in people with HIV/AIDS. As reported in a review that focussed on sub-Saharan Africa, task-shifting from physicians to nurses and midwives is a viable and cost-effective option for the management of HIV/AIDS²¹.

Other studies that investigated the effects of MLHPs support our review findings^{1,22}. However, similar to our review, previous reviews were limited by the quality of included studies. [23](#) examined the evidence for the effectiveness of MLHPs in poor resource settings and found them to be an effective option in improving the delivery of health services.

We did not find any synthesised evidence in the form of SRs for childhood and adolescent health services, ophthalmic and ENT conditions, elderly and palliative health care, or emergency medical services. There is a need for conducting well-designed primary studies on these domains to inform future plans for rolling out of MLHPs to improve the delivery of health services in LMICs. The shortage and unbalanced distribution of the health workforce is a significant obstacle in achieving better health outcomes for maternal and child health, neonatal and infant health, and communicable and non-communicable disease management in LMICs²⁴.

Judging relevance to low-income countries is sometimes tricky, and we are aware that evidence from high-income countries is not directly generalisable to low-income countries. We based our judgments on assessing the likelihood that MLHP-lead care considered in the review address a problem that would be feasible and would be of interest to decision-makers in LMICs, regardless of where the included studies took place. While we looked at global evidence, the use of GRADE enabled us to contextualise evidence to India. A detailed examination of contextual factors specific to the Indian context would have provided extensive contextualised evidence; however, exploration of specific contextual factors was not the focus of this overview. We utilised a robust, transparent and comprehensive search strategy to identify all relevant SRs. We used a standardised checklist for methodological quality assessment of included SRs. Having a wide scope covering multiple CPHC domains enabled the identification of knowledge gaps that could inform relevant stakeholders at the national and state levels.

As part of the RES process, we presented the interim policy brief to engage with key stakeholders to ensure that the product was robust, relevant, and valuable to the target audience. The stakeholders deliberated on the policy brief and provided feedback on the usefulness, relevance, format, and GRADE use. Following deliberations with the stakeholders, we made several changes to the policy brief regarding the use of standardised definitions, the use of more plain language statements, and contextualising evidence to the Indian setting. The inclusion of SRs provided more high-level insight into synthesised evidence around MLHPs. We did not update the reviews, and as such, we acknowledge the limitation of evidence from recently published primary studies.

We found several gaps in current research on MLHPs. Evidence from SRs of randomised controlled trials is important. Still, this approach may not be the most appropriate, as they are unlikely to yield data to inform such a complex intervention. Primary research on outcomes related to access to care and quality of care is required. Future studies may consider addressing the implementation aspects as part of the existing healthcare system and the cost-effectiveness in LMICs. There is a lack of empirical studies in primary healthcare settings in LMICs.

There is limited evidence on strategies and facilitators for implementing universal healthcare policies and the provision of equitable healthcare through MLHPs in India. A study in Chhattisgarh that assessed the clinical competence of non-physician clinicians and physicians in the delivery of primary healthcare services found comparable levels of competency²⁵. Another study conducted in Chhattisgarh reported that physicians and nonphysician clinicians performed similarly in patient satisfaction, trust, and perceived quality²⁶. In Assam, a three-year rural health practitioner course was developed and implemented to select, train and deploy Rural Health Practitioners (RMPs, a type of MLHP) in sub-centres, which showed significant improvements in the number and the range of services delivered²⁷.

Conclusion

In conclusion, and based on our findings, utilisation of MLHPs for care provision for certain healthcare domains may be applicable, relevant, and feasible in LMICs, including in India. MLHPs such as nurse practitioners, physician assistants, and community health officers will be required for primary care to fill the gaps in access and quality in health services. However, the roles and subsequent training and regulation of MLHPs might be different for several CPHC packages. There is a need for embedded research and robust evaluations in the future.

Data availability

Underlying data

All data underlying the results are available as part of the article and no additional source data are required.

Extended data

Figshare: Extended data.docx. <https://doi.org/10.6084/m9.figshare.12401525.v2>⁵

This project contains the following extended data:

- Appendix 1: Search strategies (since database inception up until March 2019)
- Appendix 2: Updated search strategies (April 2019 to April 2020)

- Appendix 3: Key characteristics of the included SRs
- Appendix 4: Critical appraisal results of included systematic reviews assessed using the AMSTAR-2 checklist

Data are available under the terms of the [Creative Commons Attribution 4.0 International license \(CC-BY 4.0\)](https://creativecommons.org/licenses/by/4.0/).

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Open Peer Review

Current Peer Review Status:  

Version 2

Reviewer Report 25 June 2021

<https://doi.org/10.5256/f1000research.56486.r84982>

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Guido Bendezu-Quispe

Universidad Privada Norbert Wiener, Lima, Peru

The revisions are appropriate.

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Public health, epidemiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Version 1

Reviewer Report 31 March 2021

<https://doi.org/10.5256/f1000research.26786.r81670>

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Guido Bendezu-Quispe

Universidad Privada Norbert Wiener, Lima, Peru

Abstract (Introduction: Provide only necessary information to inform the context of the study. Methods: There is insufficient information about the study methods (quality of the included studies, stakeholder engagement, others). Results: no results are presented on the evaluation of the quality of the evidence. Conclusion: The conclusion does not emphasize that the evidence is of

low or moderate quality on the usefulness of MLHPs in primary healthcare, and this should be mentioned).

Introduction:

The need for a rapid evidence synthesis for the study topic is not explicitly justified. I believe that the word "gratis" in the last paragraph is not suitable. The introduction is focused on India. This topic is suitable for LMIC. Hence, I recommend focusing the narrative of the manuscript on LMIC.

Methods:

Specify stakeholder participation. The methodology describes that a single reviewer performed the screening process (specify the reason for this).

Results:

Specify characteristics of the documents included in the analysis. There are tables that could be merged (table 2 to 6) to reduce the number of appendices since the last ones include data that should be presented in the manuscript body.

Discussion:

A very brief discussion of the results obtained on the usefulness of MLHPs in primary care was carried out. Authors should discuss and compare the results of the SRs evaluated with the available literature in the study topic.

In the document, at times the discussion of the results is oriented to a context of low- and middle-income countries and at other times to the context of India. It would be helpful for authors to target their paper to LMIC with an emphasis on India at the discretion of the authors.

Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Partly

Are sufficient details of methods and analysis provided to allow replication by others?

Partly

If applicable, is the statistical analysis and its interpretation appropriate?

Partly

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Partly

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Public health, epidemiology

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard, however I have significant reservations, as outlined above.

Author Response 14 Apr 2021

Sandeep Moola, George Institute for Global Health, Vishakhapatnam, India

Dear Guido,

Thank you for taking out time to review the paper and for your valuable comments. We will revise and upload a new version of the article based on your feedback. Thanks again.

Regards
Sandeep

Competing Interests: None

Author Response 26 Apr 2021

Sandeep Moola, George Institute for Global Health, Vishakhapatnam, India

Abstract (Introduction: Provide only necessary information to inform the context of the study.

Methods: There is insufficient information about the study methods (quality of the included studies, stakeholder engagement, others). Results: no results are presented on the evaluation of the quality of the evidence. Conclusion: The conclusion does not emphasize that the evidence is of low or moderate quality on the usefulness of MLHPs in primary healthcare, and this should be mentioned).

- Thank you for your comments. We have revised the abstract incorporating the necessary changes (page 2).

Introduction:

The need for a rapid evidence synthesis for the study topic is not explicitly justified. I believe that the word "gratis" in the last paragraph is not suitable. The introduction is focused on India. This topic is suitable for LMIC. Hence, I recommend focusing the narrative of the manuscript on LMIC.

- We have now provided a statement to justify the conduct of a rapid evidence synthesis on the study topic. We have deleted the word "gratis" in the last paragraph. (page 3) We included some information relevant to LMICs to reflect the context and the nature of the findings of this review.

Methods:

Specify stakeholder participation. The methodology describes that a single reviewer performed the screening process (specify the reason for this).

- We included relevant information on stakeholder participation (page 4). Thank you for an excellent point on single reviewer screening. We used a single reviewer approach for study screening and selection based on the requirements of the review and resources available at the time. At the time, we considered this as a reasonable approach, as it involved using a single experienced reviewer (SM) for screening with a

random verification of a subset of screening records by another experienced reviewer (SB).

Results:

Specify characteristics of the documents included in the analysis. There are tables that could be merged (table 2 to 6) to reduce the number of appendices since the last ones include data that should be presented in the manuscript body.

- Thank you. We briefly described the key characteristics of the documents under each domain of interest. We note your point about merging tables, but they have been kept separate for each domain of interest to avoid long tables and avoid confusion. We included tables related to essential characteristics of the SRs and the AMSTAR-2 checklist in the extended data file to limit the number of tables in the manuscript body. However, we did try to merge the tables, but the format appeared inappropriate.

Discussion:

A very brief discussion of the results obtained on the usefulness of MLHPs in primary care was carried out. Authors should discuss and compare the results of the SRs evaluated with the available literature in the study topic.

In the document, at times the discussion of the results is oriented to a context of low- and middle-income countries and at other times to the context of India. It would be helpful for authors to target their paper to LMIC with an emphasis on India at the discretion of the authors.

- Thank you for your valuable comments on the discussion section. We have revised the discussion section in light of the feedback.

Competing Interests: None

Reviewer Report 18 January 2021

<https://doi.org/10.5256/f1000research.26786.r76144>

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Shradha Parsekar 

Public Health Evidence South Asia, rasanna School of Public Health, Manipal Academy of Higher Education, Manipal, Karnataka, India

Thank you for providing me opportunity to review this piece of work.

Considering the lack of qualified doctors in some of the resource limited settings like India, mid-levels health providers can be an alternative. I must appreciate authors for this work and presenting the findings in a comprehensive manner.

I have minor comments:

1. The focus of the rapid overview of systematic review was on LMICs, however some of the SRs included studies conducted in high income countries (e.g., Barnard et al., 2015¹ included 50% studies from HICs, Weeks et al., 2016² included 42 of 46 studies conducted in HICs, similarly, Lassi et al., 2013³ included studies majorly conducted in HICs). Hence, it would be good if the authors make it clear in the inclusion criteria > context- what percent of included studies within SRs should have been conducted in LMICs. Or explicitly state, the evidence from HICs were eligible considering the statement reported in Discussion section, "*While we looked at global evidence....*". Secondly, in the result section it was reported, "*All SRs, except one¹¹ included studies that were mostly conducted in LMICs*". However, SR by Weeks et al., 2016 also included studies majorly conducted in HICs.
2. In the Discussion section it was reported, "*While we looked at global evidence, the use of GRADE enabled us to contextualise evidence to India.*" Although GRADE help in certainty of evidence, it is worthwhile to consider the contextual factors while contextualising the evidence to India, which I understand was not the focus of this overview of systematic review.
3. Reference numbering in the extended file and the main text do not match, kindly make necessary edits. E.g., Barnard et al., 2015 is reference number 13 in main text while in supplementary file it is 11.

References

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Is the work clearly and accurately presented and does it cite the current literature?

Yes

Is the study design appropriate and is the work technically sound?

Yes

Are sufficient details of methods and analysis provided to allow replication by others?

Yes

If applicable, is the statistical analysis and its interpretation appropriate?

Not applicable

Are all the source data underlying the results available to ensure full reproducibility?

Yes

Are the conclusions drawn adequately supported by the results?

Yes

Competing Interests: No competing interests were disclosed.

Reviewer Expertise: Epidemiology, Overview of systematic reviews, Qualitative research, Public Health, Systematic review

I confirm that I have read this submission and believe that I have an appropriate level of expertise to confirm that it is of an acceptable scientific standard.

Author Response 04 Mar 2021

Sandeep Moola, George Institute for Global Health, Vishakhapatnam, India

Dear Reviewer,

Thank you for taking out time to review the paper and for your valuable comments. Sincere apologies for the delay in replying. Will revise and upload a new version of the article based on your feedback.

Competing Interests: None to disclose.

Author Response 26 Apr 2021

Sandeep Moola, George Institute for Global Health, Vishakhapatnam, India

The focus of the rapid overview of systematic review was on LMICs, however some of the SRs included studies conducted in high income countries (e.g., Barnard et al., 2015¹ included 50% studies from HICs, Weeks et al., 2016² included 42 of 46 studies conducted in HICs, similarly, Lassi et al., 2013³ included studies majorly conducted in HICs). Hence, it would be good if the authors make it clear in the inclusion criteria > context- what percent of included studies within SRs should have been conducted in LMICs. Or explicitly state, the evidence from HICs were eligible considering the statement reported in Discussion section, "While we looked at global evidence...".

- Thank you for raising this point. We have included a statement, which was initially missing, to accurately reflect the nature of the included studies in the review.

Secondly, in the result section it was reported, "All SRs, except one¹ included studies that were mostly conducted in LMICs". However, SR by Weeks et al., 2016 also included studies majorly conducted in HICs.

- We have deleted the statement.

In the Discussion section it was reported, "While we looked at global evidence, the use of GRADE enabled us to contextualise evidence to India." Although GRADE help in certainty of evidence, it is worthwhile to consider the contextual factors while contextualising the evidence to India, which I understand was not the focus of this overview of systematic review.

We added relevant information to provide more clarity (page 22)

Reference numbering in the extended file and the main text do not match, kindly make

necessary edits. E.g., Barnard et al., 2015 is reference number 13 in main text while in supplementary file it is 11.

- Thank you for pointing out the error. We checked the main text and the extended data file and fixed the referencing numbering errors that were seen in a couple of places.

Competing Interests: None

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