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Knowledge of Accredited Social Health Activists in India: a systematic review and meta analysis of evidence drawn from primary studies published between 2005 and 2022

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Abstract

Background Since the inception of the ASHAs in the year 2005, their work horizons have increased from Reproductive, Maternal, Newborn, Child, and Adolescent health (RMNCH + A), Communicable and Non-Communicable Diseases (CD & NCD) to oral health, ophthalmologic care, and other supportive community level healthcare services. The present literature lacks comprehensive understanding and synthesis of domain-wise knowledge of ASHAs and the factors affecting their knowledge. Therefore, this study aimed to synthesize and collate the relevant evidence to understand the overall knowledge of ASHAs.

Methods This systematic review and meta-analysis sourced literature from Google Scholar, PubMed, and Web of Science. Of the 1062 articles identified, 37 articles were selected for narrative synthesis and meta-analysis which focused on knowledge of ASHAs. In meta-analysis, pooled prevalence was estimated using the random effect model. Meta-analysis was performed using the statistical software R version. 3.6.1 for Microsoft Windows.

Results The overall pooled prevalence of knowledge regarding maternal, neonatal/child health, communicable, and non-communicable diseases among ASHAs was 62%, 69%, 62%, and 73%, respectively. The level of education, years of experience, inadequate supervision, and training were the factors affecting their knowledge and subsequently its translation into practices within the community. The review also evidenced variation of knowledge among ASHAs across domains and geographical regions of India.

Conclusion The systematic review and meta-analysis highlight that ASHAs have proven to be indispensable assets to India's healthcare system with their strengths lying in maternal and child health programs. To further enhance their impact, it is imperative to invest in areas where they lack knowledge such as disease surveillance, and preventive healthcare. Empowering ASHAs with necessary resources, and training will not only enhance their capabilities but also contribute to the overall improvement of the healthcare system in India.

Keywords ASHA, Community Health Worker, Frontline Health Worker, Mitatins, Sahiyas, Knowledge, India

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Introduction

The setting up of "Accredited Social Health Activist" (ASHA) cadre in Indian health system was one of the major initiatives under the National Rural Health Mission (NRHM), launched in 2005. The NRHM, later extended to urban India and renamed as "National Health Mission" (NHM), was an effort to improve healthcare planning, administration and service delivery at the grassroot level in the country [1]. India's healthcare system is a mix of public and private providers. The public health system, though extensive, faces challenges such as shortage of healthcare professionals, and unequal distribution of healthcare services across rural and urban areas. The NRHM was introduced to address these disparities by focusing on strengthening the public healthcare system, particularly in rural areas where most of the population resides [2]. The inception of ASHA program was from similar indigenous and globally accepted health programmes (primarily in poor-resource settings) which included Community Health Workers (CHW) for leveraging the healthcare services to the unreached population [2–4] such as *Barefoot doctors* from China and *Visitadoras* under the Brazil national healthcare program [5, 6]. Jamkhed Comprehensive Rural Health Project was a pioneer in India (1970) which initiated the concept of 'team of health workers', community-level engagement, and home-visit provision [7]. Prior to the ASHA programme in the country, Mitanin and Sahiyya programme were launched in Chhattisgarh (2002) and Jharkhand (2004), respectively by the state government to increase community participation thereby increasing the quality of healthcare. Also known for the largest 'community volunteer programme' globally, India currently has 9.8 lakh ASHAs across 35 states and union territories. The term ASHA translates to 'A ray of hope' and is referred to as 'Mitanin' in Chhattisgarh and 'Sahiyya' in Jharkhand, respectively representing a 'Close friend' who consistently acts as a bridge between the community and the healthcare system [8–10]."

Since the launch of Ayushman Bharat Programme in the year 2018, the horizon of ASHA's work domain has increased from Reproductive, Maternal, Newborn, Child, and Adolescent health (RMNCHA), Communicable and Non-Communicable Diseases (CD & NCD) to oral health, ophthalmologic care, and other supportive community level healthcare services. They also work for gender norms and social determinants of health which imposes a greater burden of work on their shoulders [11]. The success of CHW programme lies in numerous factors such as logistic support, continuous education and training, and supportive supervision [5]. A woman selected as ASHA needs to have education up to 8th standard, 8 days of induction and training, and 20 days of skills-based training which is done in four rounds within the first 18 months. Various topics that are covered during induction are associated with RMNCHA, nutrition, malaria, and tuberculosis along with annual 15-days refresher training on new concepts [12]. Additionally, to enhance skills and competencies of ASHAs and to leverage the community-health outcomes, a certification program has also been launched by Ministry of Health and Family Welfare (MoHFW) in collaboration with National Institute of Open Schooling (NIOS), and National Health System Resource Centre (NHSRC) [13].

The success of the National Health Mission (NHM) and the community's welfare heavily depends on the ASHAs working at the grassroots level. Thus, it is crucial that ASHAs have a profound understanding of diverse social, health aspects, and the healthcare system. A study on voluntary health workers discovered that ASHAs effectively reached and delivered continuous primary healthcare to populations that were otherwise impenetrable to professional healthcare [14]. The evaluation of the ASHA program in 2017 highlighted a positive correlation between the frequency of training and knowledge of ASHA [7, 15]. Another evaluation on ASHA revealed that they provide constellation of services and play a potential role in providing primary health care but still need to put their knowledge into practice. The existing evidence highlights that assessments of ASHA's knowledge in India have typically been limited in scope, both in terms of focus and geography (restricted to a few blocks or villages); often limited to a single or more specific topics like cervical cancer [16], TB [17, 18], rabies [19] etc. Additionally, there is a lack of standardized tools to measure ASHA's knowledge in the country. It has also been evident through previous studies that ASHA's knowledge regarding healthcare services vary with geography and across various health domains [4, 20, 21]. The present literature lacks comprehensive understanding and synthesis of domain-wise knowledge of ASHAs and the factors affecting their knowledge. Therefore, this study aimed to synthesize and collate the relevant evidence to understand the overall knowledge of ASHAs in various domains and the associated factors associated with their knowledge.

Methodology

This systematic review aimed to evaluate the available evidence regarding the level of knowledge among ASHA workers in India, in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines [22]. The protocol for this review was registered with International Prospective Register of Systematic Reviews (PROSPERO),

Registration Number: CRD42023422158. The review was not formally published.

Search strategy

The systematic search was conducted on three online databases: Google Scholar, PubMed, and Web of Science. The inclusion period for eligible studies spanned from 2005 to 2022. The search strategy employed by the authors involved the utilization of controlled vocabularies specific to each database, as well as relevant free text terms with "Knowledge" AND "ASHA" OR "Mitanins" AND "India". Two authors (SSA and HA) independently assessed the titles, abstracts, and full texts of potentially relevant studies after removing the duplicates from the obtained list in MS Excel. A second round of title and abstract screening was performed by BT & SS. In cases where disagreements or conflicts arose during the screening process, an online discussion was initiated to reach a final consensus. If disagreements persisted, the opinion of senior authors (PM, DS, & SC) was sought. Additionally, the authors examined the reference lists of retrieved articles for any additional studies suitable for inclusion. The final extraction of data focused specifically on the topic of "knowledge of ASHAs."

Criteria for eligibility

A comprehensive systematic search was performed to identify cross-sectional and cohort studies examining the knowledge of ASHA (Accredited Social Health Activist) workers in India. Our inclusion criteria encompassed articles that investigated ASHA's knowledge, attitude, and practice. However, studies specifically focusing on assessment of pre-and post-knowledge of ASHA following a training program, their perspective, or the challenges they encounter in their work were excluded considering the diversity of topics which require focused investigations in future. Additionally, we excluded reviews, commentaries, editorials, conference proceedings, and grey literature from this review. Furthermore, articles published in non-peer-reviewed journals and those not available in English language were also excluded from our inclusion and analysis.

Data extraction

Data extraction from the included studies was conducted independently by SSA and HM, who recorded the information in a Microsoft Excel sheet. The extracted data was subsequently cross-checked by BT and SS to ensure accuracy and consistency. The collected information for each eligible study was used to create an evidence table, including the following details: Title, First Author, Study Design, Sample Size, Place of Study, Study Duration, Utilized Tool, Measures of Knowledge, Factors Affecting Knowledge, Measures of Attitude and Practice, Conclusion, Limitations, and Recommendations. The resulting evidence table, containing the characteristics of each included article, has been summarized in Table 1.

Statistical analysis

Meta-analysis was performed using the statistical software R version. 3.6.1 for Microsoft Windows [23], using three packages ("tidyverse" "meta" and "metafor"). A random-effect model was employed to conduct the meta-analysis because of high heterogeneity, and the results were presented in forest plots. The Der Simonian and Laird's approach with 95% confidence intervals (CIs) was used during the analysis [24]. The inverse of the Freeman-Tukey double arcsine transformation was used to stabilize the variance of each study in the review [25]. A forest plot was used to assess visually the prevalence estimates and corresponding 95% confidence intervals (CIs) across included studies. For the evaluation of statistical heterogeneity across studies, the I^2 statistic was used [26]. Subgroup analysis and publication bias was initially assessed by visual inspection of the funnel plot and then tested by the Egger regression test. The Trim and Fill test was used through a linear estimator whenever publication bias was potential [27].

Quality assessment of the included studies

The review utilized an adopted version of the National Heart, Lung, and Blood Institute Study Quality Assessment Tool to assess the methodological quality of the final screened articles [28]. The tool is widely utilized for assessing the quality of observational and cross-sectional studies in systematic review processes. It has 14 items which can be assessed through a criterion where possible answers were "yes", "no", or "other" (cannot determine, not applicable, or not reported). The tool enables us to score and weigh the evidence to assess the overall quality of each study as "good", "fair", or "poor" indicating the validity of findings in each study. The quality appraisal was initially done by SS and reevaluated by BT. Any disagreement during the quality appraisal process was solicited over a discussion with SC, PM & DS.

Results

Selection and characteristics of studies

The initial search furnished 1062 results. After removing duplicates, 1049 articles were found eligible for title and abstract screening. Post title and abstract screening, 106 remained for full text evaluation of which 69 were rejected because of various exclusion criteria listed in the methodology. The flow chart of study selection is visually illustrated in Fig. 1, depicted through the PRISMA flow diagram.

Table 1 Summary of studies included in the review

Sl. No	Source	Year of Publication	State	Study Design	Sample Size	Summary
1.	Mayadhar Panda et al.	2019	Odisha	Cross Sectional	1218	Most of the ASHA's were aware of immunization activities. ASHA's also responded that their role was to assist women during ANC, institutional delivery, family planning and HBNC. In this study very few ASHA's were aware regarding their role for overall health and nutrition practices.
2.	Akash Ranjan Singh et al.	2017	Madhya Pradesh	Cross Sectional	41	ASHA's had poor knowledge regarding management of tuberculosis and DOTs initiative. The primary reason for poor knowledge was lack of training and capacity building for tuberculosis programs.
3.	S R Shrivastava et al.	2012	Maharashtra	Cross Sectional	146	In this study, the ASHA's had adequate knowledge regarding maternal health services; however, they lacked knowledge regarding referral like when to refer a child, poor knowledge on vitamin A supplementation and identification of danger signs in a child.
4.	Qainat N. Shah et al.	2019	Gujarat	Cross Sectional	100	The ASHA's possess adequate knowledge regarding mental illness. The study advocates that future trainings should focus on stigma related to mental illness.
5.	Ghan Shyam Karol et al.	2014	Rajasthan	Cross Sectional	200	The study revealed that ASHA's possessed higher knowledge of child health as compared to maternal health. The study also reported inadequate knowledge for HIV/AIDS and family planning in the study population.
6.	Harsh Rajvanshi et al.	2021	Madhya Pradesh	Cross Sectional	220	The majority of the ASHA's in the study knew about mosquitoes being the main agent for spread of malaria and 84% of them knew that mosquitoes breed in stagnant water. Though malaria comes as one of the priority areas, only half of the ASHA's in the study reporting havening received training on malaria.
7.	Sumit Saxena et al.	2017	Uttar Pradesh	Cross Sectional	64	The majority of the ASHA's had good knowledge regarding newborn care practices including TIBF, immunization schedule, dry cord care, home visit within 1 week of delivery, delayed bath of newborn, timely initiation of complementary feeding, etc. ASHA's had lower knowledge on HBNC visit within 24 h of delivery and correct EBF.

Table 1 (continued)

Sl. No	Source	Year of Publication	State	Study Design	Sample Size	Summary
8.	Swathi Shet et al.	2017	Karnataka	Cross Sectional	100	The study revealed adequate knowledge of ASHA regarding the importance of vitamin and iron supplementation, and the importance of breast milk. The ASHA's also knew the management of diarrhea and they reported that trainings provided to them were inadequate and they found difficulty in understanding technical words.
9.	Ashish Baghel et al.	2017	Chhattisgarh	Cross Sectional	180	The ASHA's in this study had good knowledge on ANC, HBNC, and newborn vaccination. They also had adequate understanding of promptness for services like referral for breathing difficulties, high grade fever, etc. Knowledge regarding malaria, pneumonia and prevention of oral cancer was low among the study population.
10.	Vartika Saxena et al.	2014	Uttarakhand	Cross Sectional	168	Knowledge of ASHA's regarding complementary feeding was insufficient. They even lacked knowledge about timely initiation of breast feeding. The study also advocates the need to train ASHA's on effective counseling services related to nutrition and feeding of children.
11.	Divya Khanna et al.	2019	Uttar Pradesh	Cross Sectional	290	Only 21.4% of ASHA had good knowledge regarding screening of cervical cancer. They were not aware that a uterine cervix may develop cancer. In this study ASHA workers from urban areas had better knowledge compared to those from rural area.
12.	Ravinder Kaur et al.	2015	Punjab	Cross Sectional	170	The ASHA's in this study had good knowledge regarding health problems prevailing in their area. The study also mentioned that the roles and responsibilities should be made clear to ASHA.
13.	Neha Shah et al.	2020	Madhya Pradesh	Cross Sectional	1552	Overall, the ASHA's had good knowledge regarding diarrhea, essential newborn care, infant feeding, family planning and maternal health. Knowledge was higher among ASHA's who were educated up to or beyond 12th .
14.	Charu Kohli et al.	2015	Delhi	Cross Sectional	55	There was variation in ASHA's knowledge for minimum ANC visits in same study population. They lacked knowledge regarding complications related to pregnancy and its management. For certain conditions, though they had good knowledge their practices were not aligned.

Table 1 (continued)

Sl. No	Source	Year of Publication	State	Study Design	Sample Size	Summary
15.	Bimal Sahoo et al.	2019	Odisha	Cross Sectional	400	Majority of the ASHA's had good knowledge regarding knowledge of Japanese Encephalitis. They were also aware about its causative agent and around 50% of them knew regarding vaccine dosage and schedule. ASHA's total years of work experience and awareness of guidelines was significantly associated with their knowledge.
16.	Kaluram Yadav et al.	2019	Rajasthan	Cross Sectional	110	The majority of the ASHA's had heard about pyorrhea, tooth decay, irregular teeth, and oral cancer respectively. Around half of the ASHA's knew the correct number of teeth and that first tooth erupts between ages of 6–7 months. Adequate knowledge regarding oral health and hygiene should be promoted by ASHA's for a healthy community.
17.	Darshan K. Mahyavanshi et al.	2011	Gujarat	Cross Sectional	130	In this study, the majority of ASHA's had poor knowledge regarding newborn care, pneumonia, measles, and referral and feeding practices (both breast feeding and complementary feeding). The ASHA's also had poor knowledge regarding immunization, malaria, diarrhea, and hygiene and worm infestation.
18.	M Rohith et al.	2020	Karnataka	Cross Sectional	617	The study revealed that ASHA's had good knowledge regarding early initiation of breast feeding and importance of colostrums. The majority of the ASHA's in this study had poor knowledge regarding schedule of immunization as they had little knowledge of when to take a child for immunization.
19.	Dinesh J Bhanderi et al.	2018	Gujarat	Cross Sectional	80	The study highlighted that evaluation of the ASHA's should be conducted regularly to strengthen this grass root level cadre of health workers.
20.	Mahesh Kumar Choudary et al.	2015	Gujarat	Cross Sectional	194	The ASHA's knowledge on maternal health and immunization was satisfactory. Only half of the study population knew about dosage of Vitamin A. Knowledge of ASHA's regarding NVBDCP component was poor and only 50% of them were aware that they are also a member of the Village Health and Sanitation Committee.

Table 1 (continued)

Sl. No	Source	Year of Publication	State	Study Design	Sample Size	Summary
21.	Kumar S et al.	2012	Uttar Pradesh	Cross Sectional	135	In this study, the ASHA's had poor knowledge related to the content of their job. The majority were aware only of their role as companions for pregnant mothers to a health facility. The study also revealed that ASHA's belonging to lower castes faced discrimination in the community by upper caste people.
22.	Garg PK et al.	2013	Haryana	Cross Sectional	105	Less than half of the ASHA's in this study were aware regarding actions to be taken in case of any pregnancy complications. Only around 17–19% of the ASHA's knew about registration of birth and deaths, extending support to ANM, health planning, and their role regarding creating basic awareness on sanitation and personal hygiene.
23.	Dinesh P. Sahu et al.	2021	Odisha	Cross Sectional	60	The majority of the ASHA's had heard of rabies and its mode of transmission. They also lacked knowledge regarding its adequate management. The study found a significant gap in prevention and control of rabies among health workers. There is a need for continued professional training of public health workers at regular intervals regarding rabies and its management.
24.	Anusha Rashmi et al.	2013	Karnataka	Cross Sectional	37	The ASHA's in this study had good knowledge regarding RCH components including legal age of marriage for girls, methods to prevent STD transmission, desired birth interval between two pregnancies, safe delivery, and safe abortions. The ASHA's also had adequate knowledge regarding minimum number of ANC visits, treatment of anemia, etc.
25.	Shilpa Karir et al.	2015	Jharkhand	Cross Sectional	26	The study revealed that ASHA's had poor knowledge regarding measurement of blood pressure, blood, and urine test and only around 50% of them were aware about severe anemia as sign of referral. The ASHA's consider vaginal bleeding as a danger sign of pregnancy which needs referral. It was found that ASHA's were not doing their job passionately as her incentives were low.

Table 1 (continued)

Sl. No	Source	Year of Publication	State	Study Design	Sample Size	Summary
26.	Smitha Kochukuttan et al.	2013	Karnataka	Cross Sectional	225	Overall, the ASHA's had poor knowledge of danger signs and a substantial minority had no knowledge of any danger signs. Very few are aware of post-partum hemorrhage as a key danger sign. The majority of the ASHA's had not received any form of practical training and the content of practical training. The study highlights the importance of imparting training to ASHA's regarding identification of danger signs and complications during pregnancy and childbirth.
27.	Lopamudra Ray Saraswati et al.	2019	Uttar Pradesh	Cross Sectional	473	ASHA's skills about pneumonia assessment were poor and the mean score of knowledge of ASHA's on maternal and child healthcare was also significantly low. Though three-fourths of ASHA's reported having a supervisor, only two-thirds reported receiving supervisory support during the past month.
28.	Annapurna Kari et al.	2021	Karnataka	Cross Sectional	100	ASHA's knowledge related to practice of birth preparedness and complication readiness was found to be poor. Less than 50% of the ASHA's in the study population were able to identify facilities for delivery and referral services. The study advocates the need for training related to birth preparedness for ASHA's.
29.	Mohammad A Hussain et al.	2013	Odisha	Cross Sectional	235	The study reported that 77% of the ASHA's had adequate knowledge to use Rapid Diagnostic Tests for diagnosis of malaria. Most of them had received training related to case management guidelines and diagnosis of malaria. The ASHA's reported that they did not receive any supervisory visits in last 3 months.
30.	Divya Persai et al.	2015	Gujarat & Andhra Pradesh	Cross Sectional	512	The ASHA's revealed that they have suboptimal engagement in providing information related to specific tobacco related diseases. There is a need to sensitize ASHA's appropriately about the tobacco control program. It was also found that those ASHA's who had received training on tobacco control were 1.5 times more likely to give information on the effect of tobacco on cough and respiratory diseases.

Table 1 (continued)

Sl. No	Source	Year of Publication	State	Study Design	Sample Size	Summary
31.	Rakhi Dwivedi et al.	2022	Rajasthan	Cross Sectional	95	The majority of the ASHA's in this study were aware of investigations required for diagnosis of TB. These ASHA's also had good knowledge about DOTs, duration of treatment and timelines for sputum examination. Only 30% of the ASHA workers had knowledge about the side effects of DOTs. More than half of ASHA's did not report completing even a single patient's treatment in last three years.
32.	Brinda Suhas Godhi et al.	2021	South India	Cross Sectional	210	Around 35% of the ASHA's were found to have no knowledge regarding maternal oral health and its implication on child dentition. Less than half of the ASHA's were aware of the relationship between nutrition levels during pregnancy and child's oral health.
33.	Ajay Gajanan Phatak et al.	2021	Maharashtra	Cross Sectional	49	The skills and knowledge of ASHA workers are far deficient which potentially hampers neonatal mortality reduction. The quality of training and supportive supervision mechanism should be explored for ASHA's to strengthen their skills.
34.	Manhardeep Kaur et al.	2022	Punjab	Cross Sectional	72	ASHA workers' knowledge on ANC was good except for knowledge regarding anemia. There is a need to monitor the activities of ASHA workers on a routine basis on a large scale to check the quality of services they are providing to beneficiaries, which can further improve the performance of ASHA workers.
35.	Raju Ranjha et al.	2022	Chhatishgarh	Cross Sectional	200	Around 60% of the ASHA workers had an average knowledge score. ASHA's had poor knowledge regarding malaria diagnosis, prevention, and treatment. ASHA's deputed in low-endemic areas should be regularly imparted training on vector borne diseases to enhance their knowledge and practices.
36.	Nayayana R Vinnakota et al.	2017	Andhra Pradesh	Cross Sectional	275	ASHA's in this study were unaware of the crucial facts regarding oral diseases and oral cancer. Training regarding oral health and IEC activities for ASHA's should be considered for boosting communities' oral health.
37.	Ashish Baghel et al.	2017	Chhattisgarh	Cross Sectional	180	About 61.7% of ASHA's had knowledge regarding VHSC to develop village health plan as a part of their work and out of these about 73.9% were practicing this activity. Least level of knowledge among study subjects was found to be regarding promotion for toilet construction.

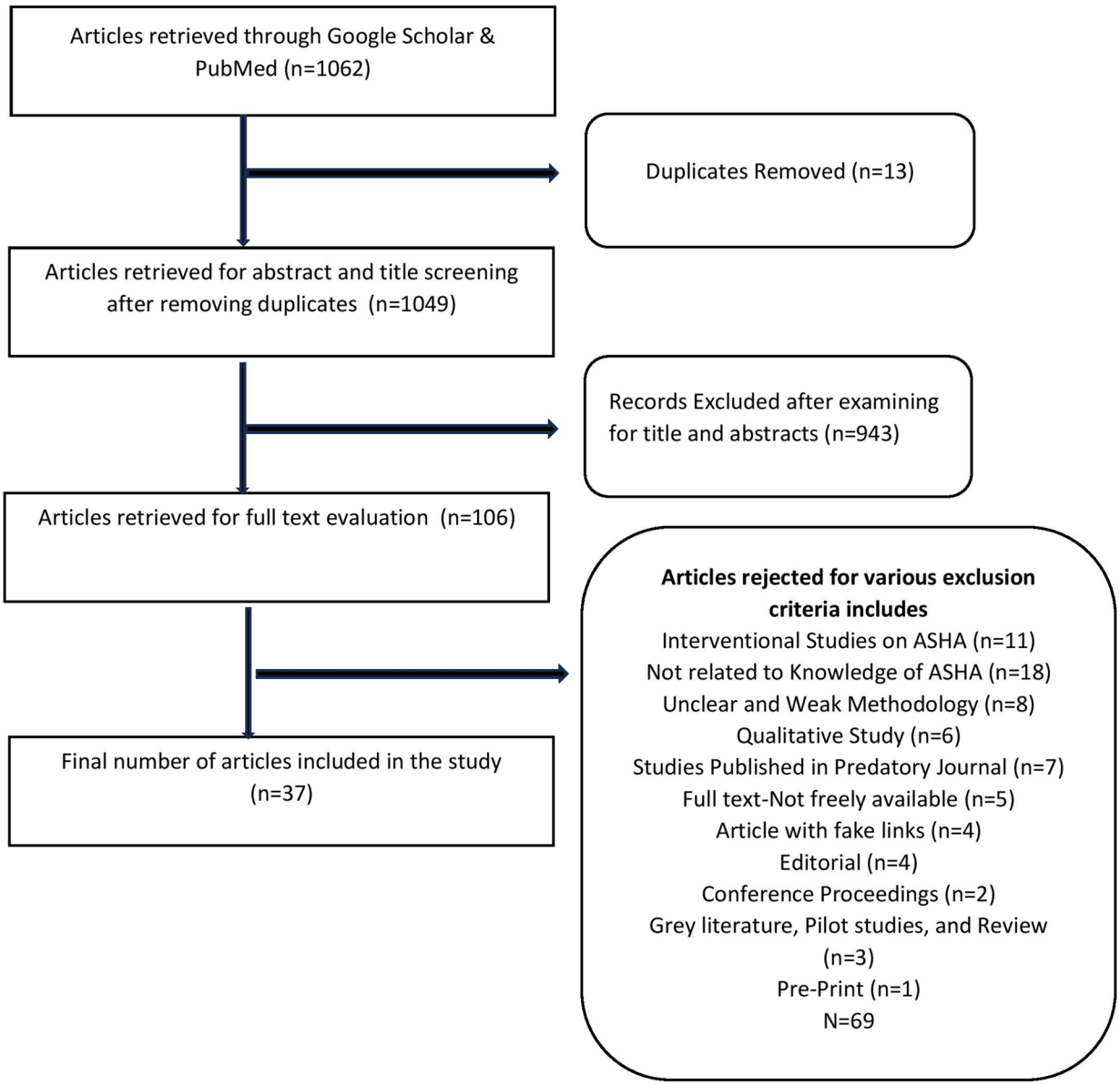

Fig. 1 PRISMA flow diagram

A total of 37 studies were finally considered for narrative synthesis and meta-analysis. All the studies were cross sectional in nature with sample size ranging from 18 to 1552. Most of the studies were related to knowledge of ASHA on RMNCH + A domain while few were also related to knowledge on communicable and non-communicable diseases, and oral health. The recruited studies reported limitation of being cross-sectional in nature. A few studies also explored attitude and practices of ASHA in various domains, however we did not intend to summarize those or include them in meta-analysis.

The quality evaluation using NHLBI tool revealed that ($n=1$) studies with poor quality, ($n=4$) with average quality, ($n=12$) with good quality, and ($n=20$) were of high quality.

Knowledge of ASHAs on maternal health

Nineteen studies, encompassing a total population of 3,876 ASHAs, have provided insights into the prevalence of knowledge regarding maternal health. Utilizing a random-effects model, the combined prevalence of maternal health knowledge among ASHA in India was estimated at 62% (with a 95% confidence interval of 57–67%). Notably,

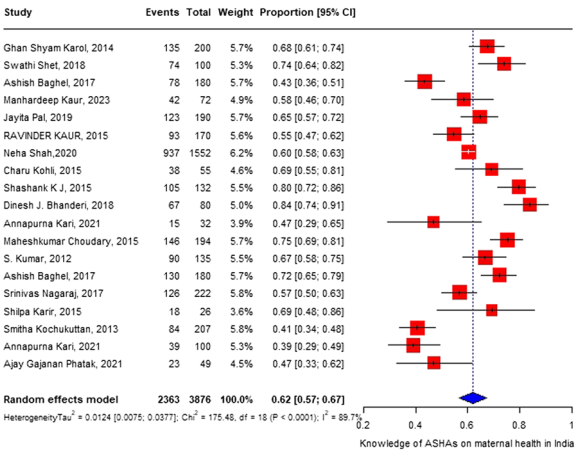

Fig. 2 Forest plot derived from knowledge of ASHAs on maternal health

there was substantial heterogeneity in these findings ($Tau^2 = 0.01$, $p < 0.01$; $I^2 = 90\%$), as illustrated in Fig. 2.

The study conducted by Panda et al. and Shrivastava et al. evidenced that ASHAs had adequate knowledge regarding promotion of institutional deliveries, accompanying pregnant women for delivery and their roles regarding family planning services (98.3%). On the other hand, ASHAs lacked knowledge regarding counselling, community advocacy, and adolescent health issues [29]. A study from Karnataka found that knowledge of ASHAs about the practice of birth preparedness, and related complications was also poor [30]. Around less than 35% had knowledge of postpartum check-ups, 67.85% were aware of severe weakness, and 33.14% were aware of blurred vision [6]. A study conducted by Kari et al., in Karnataka, evidenced that ASHAs had good knowledge regarding high blood pressure (BP) (75%), severe vaginal bleeding (82%), convulsions (43%), and knew that they can occur during labor and childbirth, but they had poor knowledge of prolonged labor (12%), retained placenta (7%), severe headache and fever (5%). Also, they had good knowledge of preparing clean items for birth (94%), saving money for delivery and complication (82%), mode of transportation (74%), and identifying health facility (39%), but ASHA's knowledge was found poor regarding identification of birth companion (34%), skilled provider (6%) and blood donor (3%).

Knowledge of ASHAs on neonatal and child health

A total of 19 studies (total population 4717) reported the prevalence of knowledge on neonatal and child health. Based on the random-effects model, the pooled prevalence of knowledge among ASHAs was 69% (95% CI: 62–75%), with a considerable heterogeneity ($Tau^2 = 0.01$, $p < 0.01$; $I^2 = 94\%$) as presented in Fig. 3.

The narrative synthesis yields that knowledge regarding child health was average [30]. Shrivastava et al. found that the ASHAs had poor knowledge on child referral in case of severe diseases like diarrhea, respiratory tract infection, and during difficulty in breastfeeding [31]. A study conducted in Surendra Nagar district of Gujarat states that ASHAs had poor knowledge regarding hypothermia and kangaroo mother care, neonatal infections, and referral conditions but they also presented with good knowledge of pre-lacteal feeds, immediate breastfeeding after normal delivery, etc. Choudhary et al. evidenced that majority of the ASHAs knew correctly about

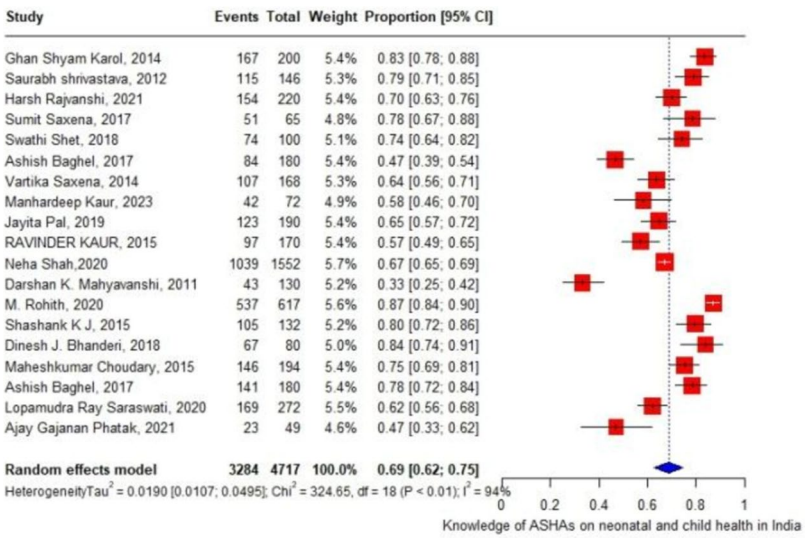

Fig. 3 Forest plot derived from knowledge of ASHAs on child health

exclusive breastfeeding, methods to prevent neonatal tetanus, administration of Bacillus Calmette-Guerin (BCG) vaccine, diseases covered by Diphtheria, Pertussis, and Tetanus (DPT) vaccine, age of Oral Polio-Virus (OPV) vaccine, and age of measles vaccine, whereas they lacked knowledge regarding dose and supplementation of vitamin A in Children [32].

Knowledge regarding oral health

The study conducted by Prusty et al. evidenced that ASHAs had poor knowledge regarding oral health awareness, including frequency of brushing, kind of brush one should use, and how often one should floss/rinse their teeth. 64.6%, 57.8% and 42.2% ASHAs had incorrect knowledge on how often one should visit dentist, frequency of dental scaling and effect of dental problems on general health respectively [33]. A study conducted in Andhra Pradesh revealed that majority of ASHAs had knowledge on number of permanent teeth (92%), causative agent for dental caries (82.2%), excess consumption of fluoride on teeth (86.5), and oral health is important for general health (84.7%), however the knowledge about dental caries identification (52.3%), dental calculus (30.2%), signs of oral cancer (27.6%), cause of dental plaque (9.8%) and frequency of changing toothbrush (7.3%) was comparatively less [34]. Godhi et al. found that less than half of the ASHAs had adequate knowledge on early childhood caries, and only 35.5% had knowledge about implication of maternal oral health on child's dentition [35].

Knowledge of ASHAs regarding communicable and non-communicable diseases

Eleven studies, involving a total population of 1,785 ASHAs, have examined the prevalence of knowledge concerning communicable diseases among ASHAs. Using a random-effects model, it was found that the collective prevalence of knowledge on communicable diseases among ASHAs in India stands at 62% (with a 95% confidence interval ranging from 47 to 76%) with significant heterogeneity in these findings ($Tau^2 = 0.06$, $p < 0.01$; $I^2 = 98\%$), as depicted in Fig. 4.

In Fig. 5, the knowledge of ASHAs regarding non-communicable diseases (NCDs) was investigated, with a pooled prevalence of 73% (with a 95% confidence interval ranging from 45 to 94%) with $Tau^2 = 0.10$, $p < 0.01$; $I^2 = 99\%$).

The studies included in the review found that ASHAs had poor knowledge related to Human Immunodeficiency Virus-Acquired Immune Deficiency Syndrome (HIV-AIDs), pneumonia, and vector borne diseases. A study from Chhattisgarh revealed that only 25% of the ASHAs had good knowledge regarding signs and symptoms for pneumonia. Choudhary et al. found that only 53.6% ASHAs knew about diseases transmitted by mosquitoes, 38.6% knew the breeding places of mosquito, 25.2% knew the removal of breeding places of mosquitoes. Singh et al. concluded that knowledge about various tuberculosis (TB) related components ranged between 5 and 76% while Dwivedi et al. noted it to be between 20 and 99%. Studies assessing knowledge on rabies and bite management revealed that overall knowledge about rabies, fatality, and transmission ranged between 34 and 98%. The majority of ASHAs knew about animal bite,

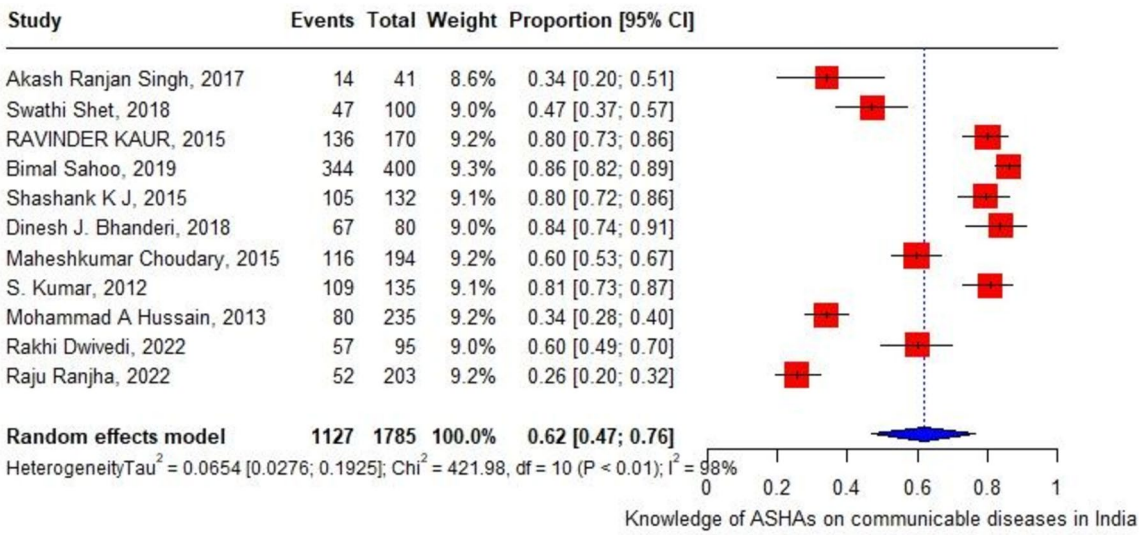

Fig. 4 Forest plot derived from knowledge of ASHAs on communicable diseases

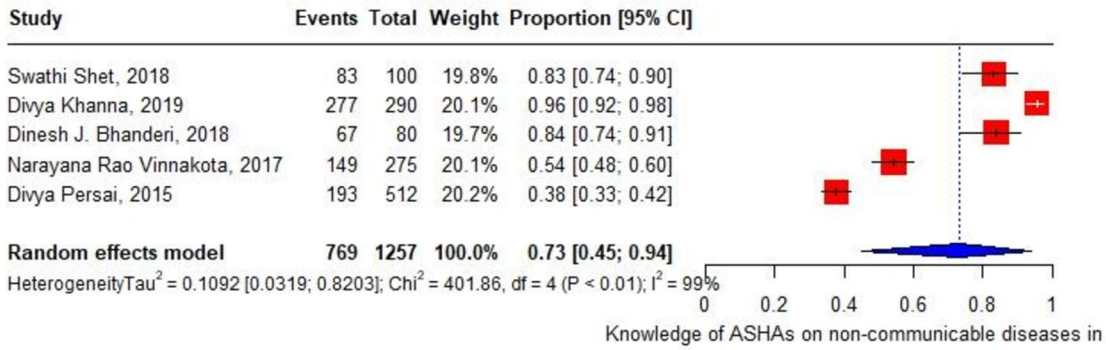

Fig. 5 Forest plot derived from knowledge of ASHAs on non-communicable diseases

specifically dog, to be the most common mode of transmission while 10–62% suggested other animals also (pig, cat, rat, monkey, fox etc.). Most ASHAs knew that Tetanus toxoid and anti-rabies vaccine were essential for preventing mortality after an animal bite [19].

For non-communicable diseases the reviewed studies found that ASHAs had stigmatized view of people with mental illness but on the other hand they believed that mental illness deserved equal attention as physical illness. It was also reported that ASHAs had poor knowledge regarding cervical cancer screening. Studies from Gujarat and Andhra Pradesh highlighted that ASHAs could link the effect of tobacco with respiratory diseases such as (75%), lung cancer (66%), tuberculosis (63%), teeth and gum disease (42%). About one-third of ASHAs associate heart diseases with tobacco. However, they were unaware about the ill effects of tobacco on reproductive health and adverse birth outcomes such as low-birth weight, premature delivery, and sudden infant death syndrome. The majority of ASHAs reported that patients hold negative attitudes towards counselling regarding non-communicable diseases Fig. 6.

The narrative synthesis also found that largely, ASHAs had limited knowledge of work components in health system, received less cooperation from health staff, had delayed refilling of drug kit, incentive-oriented practices, delayed and inadequate payment of incentives which for influenced their work performance. The studies included in the review also found that ASHAs lacked knowledge regarding NHM and VHSNC.

Discussion

The Indian government's goal in placing ASHAs in rural areas was to reduce morbidity and mortality among society's most vulnerable members: infants, young children, and pregnant women. The findings of this systematic review underscore both strengths and challenges of ASHA's knowledge. ASHAs have demonstrated proficiency in key healthcare areas, particularly maternal and child health. They are the pillars of the Indian public healthcare system, and their knowledge might catalyze in improving the community's health status ultimately leading to at par health indicators being at par with global standards [36]. Apart from knowledge and skills, environmental and intrinsic factors such as their motivation have been found to affect their knowledge and performance of health programs. Overall, the presented systematic review with 37 studies varied across domains and geographical regions within India. Since the findings of the studies were mixed and ranged variedly across subjects among the ASHA cadres, this analysis might help in revamping the knowledge levels among ASHAs and their performance and working upon the attributing factors. Factors such as educational standard, years of experience, lack of training, inability to comprehend technical words, lack of supportive supervision impacts knowledge of ASHAs and practice within the community [10, 19, 20].

The presented study found that ASHAs in maternal health presented as forest plot revealed that their knowledge was little more than 50%. This revelation challenges the prevailing notion that ASHAs are universally well-versed in maternal health practices. Though our review found ASHAs had adequate knowledge regarding promotion of institutional deliveries, accompanying pregnant women for delivery and their roles regarding family planning services, they lacked knowledge regarding counselling, community advocacy, and adolescent health issues. Our findings are in concordance with primary studies examining similar measures which reveal ASHA's proficiency in compulsory ANC visits, IFA tablet consumption, and identification of high-risk pregnancies [10, 20].

The narrative synthesis of our review yields that knowledge regarding child health was average among ASHAs. Particularly the studies concluded that ASHAs lacked knowledge on child referral in case of severe diseases

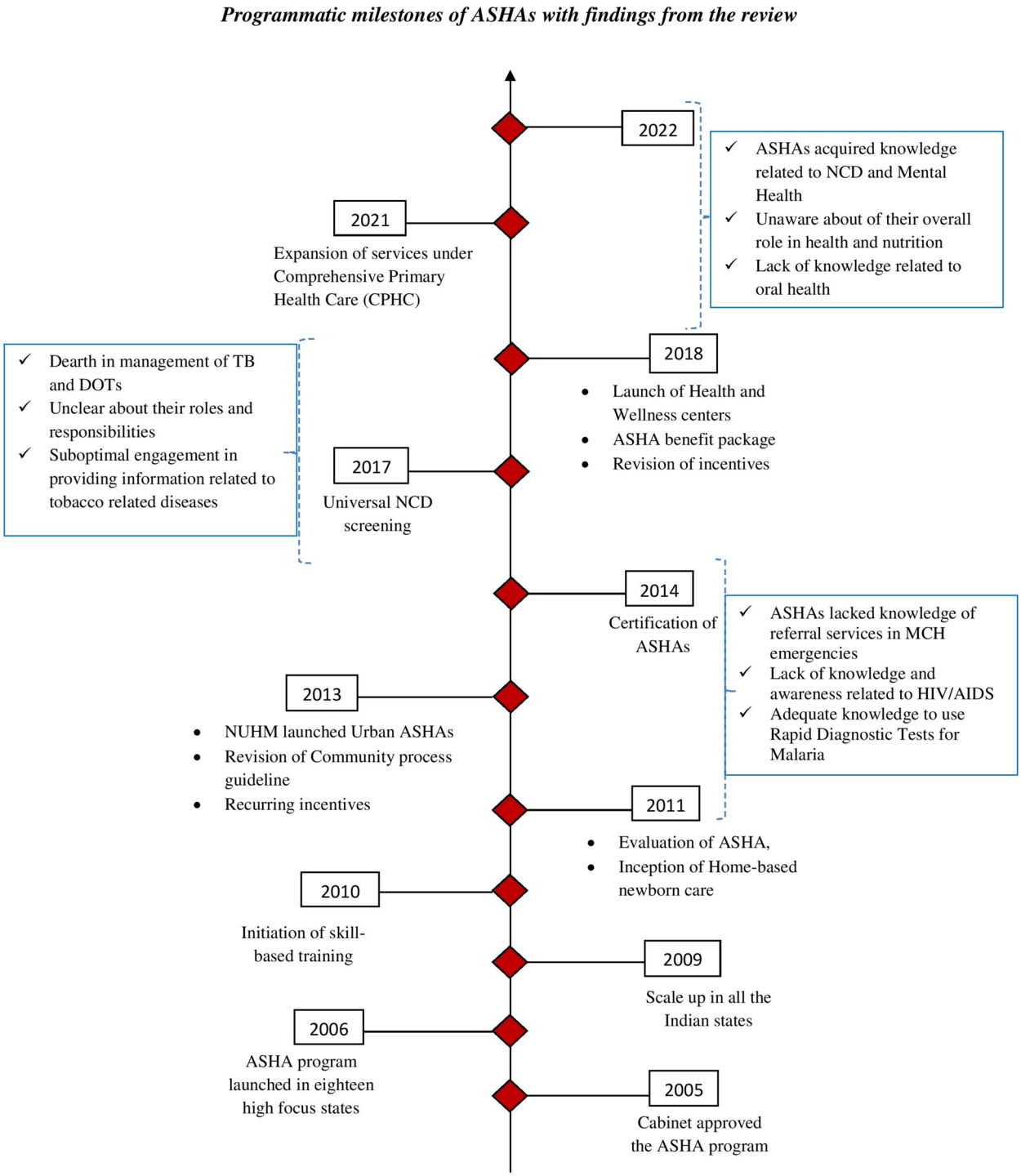

Fig. 6 Programmatic milestones of ASHAs with findings from the review

like diarrhea, respiratory tract infection, and during breastfeeding highlighting the need of training ASHAs on critical aspects of child health. A similar necessity has been laid out by Deepesh Swami et al. that ASHA workers need to emphasize their knowledge regarding RCH package and transact it into daily practices. Job aids and online applications have showcased an increase in the knowledge and performance in the community on various Maternal, Newborn, & Child Health (MNCH) related topics [37, 38]. The presented review also revealed poor

knowledge of ASHAs regarding hypothermia, kangaroo mother care, neonatal infections, and referral conditions. These findings contrast the findings from a study which reports that majority of the time and focus of ASHAs in the community was found to be associated with child health and an increase in district's proportion of villages with ASHA significantly associated with increase in knowledge related to child health [39]. The narrative synthesis of our findings reveals less knowledge about breastfeeding among ASHAs. This is in contrast with study by Mrigen Deka and B.P Mathur which revealed that ASHAs had strong knowledge regarding breastfeeding [40]. An assessment of knowledge of ASHA workers regarding RCH packages in Jodhpur district evidenced that more than half of ASHA workers had average knowledge regarding RCH packages which is in concordance with our findings of meta-analysis related to child health which lays out the need of refresher trainings of ASHAs [37, 39].

The studies included in the review found that ASHAs had poor knowledge related to Human Immunodeficiency Virus-Acquired Immune Deficiency Syndrome (HIV-AIDs), pneumonia, and vector borne diseases. Global studies have concluded that though community health workers have a high level of knowledge related to HIV, they tend to display negative attitudes and poor practices due to fear of contracting HIV [4, 6, 7]. Despite the emerging infectious and vector-borne disease burden, the diseases under National Vector Borne Disease Control Program (NVBDCP) were less focused when compared to areas like RMNCH + A. The synthesis of the narrative findings highlighted that the overall knowledge among ASHAs on NCDs was comparatively higher than that on CDs. This could be probably because health programs globally and in India have more focused towards the rising burden of NCDs as it is a major threat to the public health. Moreover, with the introduction of Ayushman Bharat in the country in 2018, ASHAs had direct involvement in mobilization of screening, health promotion, and follow up for NCDs. Furthermore, since the inception of ASHA program in India, Multipurpose Workers, and Auxiliary Nurse Midwife (ANMs) had lead roles in management of communicable diseases in the community, which limited ASHAs inclination and knowledge towards CDs. More than half of the ASHAs knew about the diseases transmitted by mosquitoes whereas around 3/4^{rth} of them were unaware about the removal of the breeding places of mosquitoes as prevention. The findings are in concordance with Harsh Rajvanshi et al. which revealed that ASHAs were not adequately trained or stocked for malaria parasite species identification and treatment. Guidelines laid by MoHFW highlights that ASHAs are trained under NRHM on vector borne diseases, while special training is imparted to ASHAs in high malaria endemic areas by NVBDCP [41]. The presented review also highlighted that rigorous training of ASHAs, and regular supervisory visits needs to be considered for enhancing knowledge and good practices in the community [17, 21]. Since the ASHAs are residents of the village and could be easily approachable, there needs to be awareness generation in the community regarding availability of free of cost diagnostic and treatment services for malaria by them. Additionally, prior studies have evidenced that after one training session, rate of referral increased significantly with a substantial knowledge boost among ASHAs related to Kala-azar/other vector borne diseases [14]. The findings of our systematic review also revealed that the knowledge of ASHAs regarding the treatment of tuberculosis varied across the states; still none of the ASHA had reported completion of single patient treatment. Our findings are in concordance with studies that have revealed the growing work burden of community health on CHWs which has impacted their social conditions, mental health, patient adherence and communication.

Previous literature states that mental health often receives insufficient attention, particularly in Low-and Middle-Income Countries (LMICs). In India, the burden of mental health issues escalates more because of the huge population [42]. The presented review found that the knowledge ASHAs was adequate however, there attitude towards it was stigmatized. They believed that receiving treatment from a professional psychiatrist was preferable than receiving treatment from spiritual healers which indicates a good practice for ASHAs in rural areas. The findings are in concordance with previous research, ASHAs also stated that they thought patients with mental illnesses were different from others and were unsure of how to address it. But the CHWs were more adept at identifying depression and had less of a stigmatizing outlook on mental health after the training sessions on mental health [43]. Few studies also evidenced that ASHAs who had received training on mental health as part of the government programme were able to identify mental illnesses.

Furthermore, our findings revealed that, though the effect of tobacco on respiratory system and oral cavity was well known to ASHAs, they could not relate its ill effects on birth outcomes and other reproductive problems. Previous evidence revealed that oral health has been found to be the area of concern as the majority of the ASHAs were unaware of the oral health problems and its awareness. The level of knowledge among ASHAs enables the community to seek oral healthcare services. Studies published globally suggest that training sessions on oral healthcare should be carried out by public health

dentists to empower ASHAs to help the community in ruling out the causes and prevention of oral problems. Our review also presented that ASHAs possessed a reasonable amount of understanding regarding rabies and its treatment. However, findings from similar settings have suggested continuous training of public healthcare workers for continuous support and upliftment of ASHAs on this dead-end disease [44].

While systematic reviews and meta-analyses are valuable tools for evidence synthesis, they have both strengths and limitations. The strength of this study is that it has provided a comprehensive overview of ASHA's knowledge on various domains. We have also followed a structured and transparent methodology, minimizing selection bias. The review has certain limitations as well, first the outcome of the review "knowledge" cannot be associated with training as the included studies did not determine any causal-effect relationship. The second limitation is publication bias where studies with statistically significant results are more likely to be published which can influence meta-analyses leading to an overestimation of effect sizes and heterogeneity. Finally, the quality of primary studies selected in the review can vary significantly. We recommend that future evaluations should assess the causal relationship between training and knowledge of ASHA in the country.

Conclusion

The systematic review and meta-analysis underscore the necessity for customized interventions to enhance the knowledge of ASHAs across various health domains, particularly in addressing complications and disease referrals. Given the crucial role of ASHAs in service delivery, especially with the expanded scope under Ayushman Bharat, it is important to prioritize regular training and capacity-building initiatives. Establishing mentorship programs where experienced ASHAs guide new recruits can facilitate knowledge transfer and practical skill development. These interventions, combined with continuous support and recognition, can significantly enhance the effectiveness and efficiency of ASHA program in India. The roles and responsibilities of ASHAs are dynamic and ever changing, with newer developments and additions of verticals within health system, domain wise training by specific and concerned departments along with consistent evaluation and reporting to illuminate contextual factor would enhance the delivery of services in rural community. The existing incentive policy for ASHAs can be revised by linking incentives directly to measurable health outcomes. This revision should include a tiered incentive structure that rewards ASHAs not only for achieving basic health targets but also for surpassing them. Additionally, incorporating regular/refresher training sessions and evaluations into the incentive framework will ensure that ASHAs are continuously updating their knowledge and skills. Structured community feedback mechanisms should be implemented to enhance accountability, ensuring that it reflects true performance and commitment of ASHAs.

Abbreviations

ASHA	Accredited Social Health Activist
ANM	Auxiliary Nurse Midwife
AIDS	Acquired Immunodeficiency Syndrome
BCG	Bacille Calmette-Guerin
CD	Communicable Disease
CHW	Community Health Worker
DPT	Diphtheria Pertussis Tetanus
HIV	Human Immunodeficiency Virus
LMIC	Low-and Middle-Income Countries
MNCH	Maternal Neonatal and Child Health
MoHFW	Ministry of Health and Family Welfare
NCD	Non-Communicable Diseases
NHLBI	National Heart Lung and Blood Institute
NHM	National Health Mission
NHSCRC	National Health System Resource Centre
NIOS	National Institute of Open Schooling
NRHM	National Rural Health Mission
NVBDCP	National Vector Borne Disease Control Programme
OPV	Oral Poliovirus Vaccine
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta Analyses
PROSPERO	International Prospective Register of Systematic Reviews
RMNCH+A	Reproductive Maternal Neonatal Child Health- Adolescent

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Authors' contributions

SS and BT conceived and conceptualized the study, conducted preliminary literature search, screening of articles, quality appraisal, crafted the original draft. MB carried out necessary statistical analysis and was responsible for drafting results and providing statistical expertise. HM & SSA conducted article screening, and generated narratives for manuscript. PM, DS, and SC were responsible for reviewing, editing, and providing critical inputs to the manuscript. All authors have read and approved the final version as submitted.

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Data availability

The extracted data from published articles and narratives are available with primary and corresponding authors and can be made available on request.

Declarations

Ethics approval and consent to participate

The present study utilized data from published articles for meta-analysis. Therefore, no ethical approval was required for conducting this study.

Consent for publication

Not applicable.

Competing interests
The authors declare no competing interests.

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