Healthcare Utilization and Access Barriers among Particularly Vulnerable Tribal Groups (PVTGs) in India: A Systematic Review and Meta-analysis

Subham Prasad Sahoo[1], Manashree Manamukta Naik[2] and Prasanna Kumar Patra[3]

Affiliations:

[1]Post Graduate Teacher (PGT) in Anthropology, BJB Higher Secondary School, Bhubaneswar & PhD Research Scholar, Department of Anthropology, Utkal University, Bhubaneswar, Odisha, India.

[2]PhD Research Scholar, Department of Anthropology, Utkal University, Bhubaneswar, Odisha, India.

(Corresponding Author)

[3]Professor, Department of Anthropology, Utkal University, Bhubaneswar, Odisha, India.

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Abstract

Background

Although the Government has tried to solve the problem of health disparity, some of the tribes in India are extremely marginalized and there are some tribesmen who are under the status of Particularly Vulnerable Tribal Groups (PVTGs) who are facing a tremendous health disparity. Socioeconomic and cultural barriers, inadequate infrastructure and geographical isolation are often the reasons why they do not have access to the most basic health care systems. There were a number of studies on the health condition of tribals in India and those pertaining to PVTGs' utilization of healthcare services were available but these studies were fragmented and region specific/community specific.

Objective

This systematic review and meta-analysis were done with an overall objective to: Synthesis available evidence regarding healthcare utilization pattern and barrier to healthcare access amongst PVTGs in India and Identify the important determinants of healthcare seeking behaviors.

Methods

A systematic search of the studies was conducted on PubMed, MEDLINE, Scopus, Embase, PsycINFO, ASSIA, google scholar, Shodhganga and other related government reports from the years 2016-2026. The research was carried out according to the PRISMA 2020 guidelines and registered in PROSPERO (CRD420261420500). Qualitative, mixed-methods, cohort, and case-control studies of PVTGs were considered to be eligible. Joanna Briggs Institute (JBI) Critical Appraisal Tools were used to rate the quality of the studies. For quantitative data, random effects meta-analysis was used for synthesizing the meta-analysis.

Results

The articles included in the review consisted of 110 studies with 78,542 people (of which 84 were included in the meta-analysis). The pooled prevalence of overall healthcare utilization is 52.8% (95% CI: 48.2 to 57.4%). Maternal healthcare utilization was estimated at 51.2% (95% CI: 45.8-56.7%), institutional delivery coverage at 47.8% (95% CI: 41.9-53.7%), and child immunization coverage at 63.5% (95% CI: 58.4-68.6%). Geographic, economic, health-system, sociocultural and language barriers as well as low

health literacy are the most common features cited as restricting access to health-care services. The major problems identified in most of the PVTG communities was geographic isolation and poverty.

Conclusion

PVTGs continue to face less access to health and health services than other groups in India and health service access is still far from equitable barriers still remain significant. Along with the development of community-based interventions, culturally competent healthcare delivery, access to mobile healthcare and improving healthcare infrastructure are critical issues in reducing health inequities for PVTGs. Future work should be emphasized that can be used to produce and evaluate community-level evidence to support targeted health care interventions aimed at inclusive, equitable health development.

Keywords: Particularly Vulnerable Tribal Groups (PVTGs); Healthcare Utilization; Healthcare Access; Healthcare-Seeking Behavior; Indigenous Health.

1. Introduction

1.1 Tribal Health in India

India also has one of the largest indigenous populations, at about 8.6% of the total country population which are termed as Scheduled Tribes (STs). The are highly varied by culture, language, environment and economics, and are located in different types of landscape with particular emphasis on forest, hill, plateau, desert and far from urban centers rural areas. Although tribal people enjoy full protection under the constitution of their respective states and there are many welfare measures to improve their social and economic status, but the same is not the case in health, education, income and essential services side where there are vast disparities between tribal and non-tribal people [2].

Along with the Scheduled Tribes as a larger group, the Government of India has demarcated a specific segment as Particularly Vulnerable Tribal Groups (PVTGs) which is a more marginalized group. These groups which earlier identified as Primitive Tribal Groups are now renamed to bring in development or respectful attitude with them. Literature of the field identifies PVTGs by the following characteristics: a pre-agricultural technology, stagnation/reduction in population growth, low literacy rates and living on a subsistence level [3]. Their developmental needs also have required a special attention to their unique forms of susceptibility; their services have been specifically targeted, as have their needs required a special policy focus.

So far there are 75 identified PVTGs in 18 States/UTs [4]. They are primarily located in States such as Odisha, Madhya Pradesh, Chhattisgarh, Jharkhand, Maharashtra, Andhra Pradesh, Telangana, Rajasthan and Including Islands of Andaman and Nicobar. In Odisha, 13 groups are officially recognized as PVTGs [5] and the State has the highest population of PVTGs. Numerous PVTGs are located in remote locations and are enveloped by thick forests, mountains and have hampered connectivity. These environmental and infrastructural restrictions have a great impact on their healthcare, education, and response to other public services [6].

1.2 Health Status of PVTGs

The health profile is the result of intergenerational social exclusion and poverty, undernutrition, environmental hurdles and barriers and inadequate health care. For these communities, maternal health indicators are still much worse than the national average. Low uptake of ANC services, low institutional delivery and less access to SBAs have been reported for a number of PVTGs [7]. Cultural practices, remoteness without adequate health infrastructure make maternal morbidity and mortality risks high.

The health conditions for the children of PVTGs are also of concern. Stunting, wasting and micronutrient deficiencies have been found to be high among various tribal communities [8]. Children are at a higher risk of being under-vaccinated as well as experiencing poor nutrition and exposure to communicable diseases, which can lead to poor growth and development. Malnutrition is a public health issue among children that these communities are plagued by [9].

In absence of basic infrastructure, the tribal and PVTG population continues to suffer from the devastating impacts of communicable diseases. Diarrhea and respiratory tract infections, TB, vector borne diseases and malaria are endemic in a lot of the tribal dominated areas [10]. Environmental factors, poor sanitation, unsafe drinking water, the lack of recognition and late presentation of disease

affect the transmission and control of diseases. Also, indigenous people are more likely to suffer from some of the NTDs, due to poor surveillance and outreach by healthcare providers [11].

Health problems are further compounded by nutritional problems. Due to the seasonal availability of forest produce, food insecurity, low productivity of agriculture and poverty, PVTGs are entirely vulnerable to chronic level of undernutrition [12]. Periodic surveys have reported high rates of anemia amongst women and children, which is indicative of poor nutrition status and access to services. Hence, in some PVTG communities these indicators such as infant mortality, under five mortality rates and diseases burden are higher as compared to the national level [13]. The ongoing health disparities call for evidence-based policies and programs focused on improving health services access and utilization.

1.3 Healthcare Access Challenges

The use of health-care services of PVTGs is determined by a mix of health-system, cultural, socioeconomic and geographical factors. One of the major impediments to access to health care is geographical isolation. Numerous PVTGs live in the far forested and hilly areas, far away from healthcare services. Poor road conditions, seasonal accessibility including during the rainy season and inadequate transport system are some of the issues that limit late or non-use of health services [14].

Poverty is also a cause for limited access to the health care sector. The majority of members of the PVTB (P V Tribesmen) families are engaged in subsistence agriculture or in collecting in the forest or in doing day labor work, earning very little and insecure income. Many people do not seek care due to indirect costs of using public health care services, such as transportation, lost work, board and lodging, as well as their own out-of-pocket payments for medicines, even if the services are free [6]. Fines in accessing preventive, promotive and curative services in the field of health are thus the hindrance for access to the health services.

Traditional healing practices, cultural norms and beliefs also affect the use of the health care and the level of utilization. The involvement of tribal communities, indigenous knowledge systems/Tribal traditional healers in the management of illness in the tribal community is important. Such practices can contribute to the continuity of cultural practices and social cohesion, but sometimes may prevent access to formal health services and particularly, identify those conditions that require specialized medical care [15]. Additionally, there may not be a trust with the mainstream health providers due to past experiences of marginalization and discrimination.

Language barriers are other obstacles that present challenges. Several PVTGs use indigenous languages for most communication and these are different from the regional or official languages which are used within health care systems. Communication problems are likely to make it hard for patients to grasp the diagnosis, treatment and prevention information. Patients' adherence to now-adopted treatment plans is known to be negatively affected by poor culturally sensitive communication, and so is their satisfaction with health care received [7].

Another key issue is also the absence of health care facilities in tribals. Insufficient staffing in healthcare, lack of testing capacity, insatiability of medicines and poor referral systems mean that the delivery of services is insufficient [16]. There is also a problem of inadequate staffing in primary health care centers that generates disparities for PVTGs, and the lack of outreach services.

1.4 Rationale of the Review

While there is an increasing literature to examine access to healthcare and health outcomes of the tribal populations in India, there is a fragmented body of literature on PVTGs. The methodological, healthcare and geographic indicators and the characteristics of the population used in previous analyses are somewhat varied. Consequently, there is little evidence that is strengthened by patterns of health care use and potential barriers to the use of health care at a population level for each of these groups of highly vulnerable peoples.

Also, there is a scarcity of any systematic review or meta-analysis types of studies at the national level that have integrated the available evidence on the healthcare utilization pattern and barriers to access of PVTGs. Base on this kind of evidence synthesis, common problems can be identified as well as gaps of knowledge and regional differences can be identified. A systematic review of literature can help inform policy makers, healthcare planners, tribal welfare agencies and researchers when striving for health equity and health coverage for marginalized indigenous people.

1.5 Objectives of the Review

The current systematic review and meta-analysis are meant to:

i. Compare the rate of healthcare utilization of Particularly Vulnerable Tribal Groups (PVTGs) in the country.

ii. Identify and categorize the obstacles impacting PVTGs' health care service access.

iii. Use quantitative evidence to estimate pooled prevalence of healthcare utilization indicators when there is adequate evidence.

iv. Assess the healthcare utilization and the existing barriers to accessing health care for the different PVTG population in India at regional level.

2. Methods

2.1 Protocol Registration

This systematic review and meta-analysis were carried out following a pre-specified protocol on the International Prospective Register of Systematic Reviews (PROSPERO). Registration was completed under registration number **CRD420261420500** before the formal study screening or extraction of data; this was done to achieve methodological transparency, minimize duplication of effort and minimize reporting-bias. The protocol addressed the objectives; the eligibility, search, outcomes of interest, quality assessment; and planned data synthesis. The changes in the protocol will be noted and mentioned in the published article, as a result of the review process.

2.2 Reporting Guidelines

The review was done and reported according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement 2020. PRISMA 2020 offers a full set of guidelines for systematic review planning, execution and reporting. The review process consisted of identification, screening, eligibility and the inclusion of studies. A PRISMA Flow diagram will be included to demonstrate the studies selected, as well as why they were excluded at each step.

2.3 Eligibility Criteria

Eligibility criteria were formulated by according to Population–Exposure–Outcome–Study Design.

Population

The studies involved officially recognized Particularly Vulnerable Tribal Groups (PVTGs) residing in India. Male and female as well as all age groups and geographical region were included and studied. Those studies that did not give any data of PVTGs separately were excluded.

Outcomes

Studies fulfilled the following requirements for inclusion were those reporting one or more of the following outcomes:

i. Healthcare utilization

ii. Healthcare-seeking behavior

iii. Healthcare access barriers

iv. Outpatient healthcare utilization

v. Inpatient healthcare utilization

vi. Access to maternal health care services

vii. Using child health care services

viii. Immunization uptake

ix. Institutional delivery

x. Antenatal care utilization

xi. Preventive healthcare utilization

xii. Availability of health care facilities.

Study Designs

The review included:

i. Cross-sectional studies

ii. Cohort studies

iii. Case-control studies

iv. Mixed-methods studies

v. Qualitative studies

vi. Community-based surveys

vii. Public health reports with primary data.

Exclusion Criteria

Research was excluded if they:

i. Have been conducted outside the country of India.

ii. Included non-PVTG populations without individual PVTG data;

iii. Did not report data on health care utilization or health care access outcomes.

iv. Are editorials, letters/opinion papers, or conference abstracts.

v. Were review articles.

vi. Were duplicate publications.

vii. Lacked adequate methodological information.

Table 1. Eligibility Criteria for Study Selection

Component	**Inclusion Criteria**	**Exclusion Criteria**
Population	PVTGs in India	Non-PVTG populations
Outcomes	Healthcare utilization, healthcare-seeking behavior, healthcare access barriers	No healthcare-related outcomes
Study Design	Cross-sectional, cohort, case-control, mixed-methods, qualitative studies	Reviews, editorials, commentaries
Setting	Community, household, facility-based studies	Studies outside India
Language	English-language studies	Non-English studies without translation

2.4 Information Sources

A literature search will be done on various electronic databases and additional sources, in order to identify relevant studies. Databases will be searched such as:

i. PubMed

ii. MEDLINE

iii. Scopus

iv. Embase

v. PsycINFO

vi. ASSIA (Applied Social Sciences Index and Abstracts)

vii. Google Scholar

To capture the grey literature and unpublished evidence, there will be additional searches through:

i. Shodhganga

ii. WHO Global Index Medicus

iii. Ministry of Tribal Affairs reports

iv. Government of India reports

v. ICMR publications

vi. List of reference studies included

There will no restrictions on the publication status. To minimize publication bias, searches will be made of peer-reviewed literature as well as grey literature.

Table 2. Information Sources Included in the Search Strategy

Source Type	Information Source
Biomedical Databases	PubMed, MEDLINE, Embase
Multidisciplinary Databases	Scopus, Google Scholar
Social Science Databases	PsycINFO, ASSIA
Grey Literature	Shodhganga, WHO Global Index Medicus
Government Sources	Ministry of Tribal Affairs, ICMR, Government Reports
Additional Sources	Reference lists of included studies

2.5 Search Strategy

Controlled vocabulary and free text keywords associated with PVTGs, healthcare utilization, healthcare access and health-seeking behavior were used when developing a search strategy. Boolean operators (AND & OR) were used to combine search terms.

The main search term entered into PubMed was:

("Particularly Vulnerable Tribal Group" OR PVTG OR "Primitive Tribal Group*" OR tribal OR indigenous) AND ("healthcare utilization" OR "health service utilization" OR "healthcare access" OR "health services accessibility" OR "health seeking behavior" OR "treatment seeking" OR "maternal health services" OR "child health services" OR immunization OR "institutional delivery") AND (India)*

Likewise, other databases were searched using equivalent search strategies for their index and search requirements. A search of the literature was performed which sought to identify studies from January 2016 to May 2026.

2.6 Study Selection

All the retrieved data was downloaded to a reference management software, and redundant data was eliminated. The process for selecting the study of the students was done in three stages.

Title Screening

Two reviewers independently examined the title of all retrieved studies to determine whether or not they might be relevant.

Abstract Screening

Abstracts of potentially-eligible studies were evaluated independently by two evaluators using the eligibility criteria.

Full-Text Screening

Independent rating of the full-texts of studies that met the inclusion criteria was performed by two raters. The reasons for exclusion were recorded for studies that were excluded during the full-text phase. In case of any disagreement among the reviewers, third reviewer was involved in discussion and consultation.

The identification, screening, eligibility assessment and eventual inclusion of studies was summarized using a PRISMA flow diagram.

2.7 Data Extraction

A common data extraction form was created and used as a pilot prior to data extraction. Data of all included studies was independently extracted by two reviewers. Extracted variables included:

i. Author(s)

ii. Year of publication

iii. Study location (state/union territory)

iv. Name of PVTG community

v. Study design

vi. Sample size

vii. Participant characteristics

viii. Healthcare utilization indicators

ix. Healthcare-seeking behavior indicators

x. Healthcare access barriers

Key findings

Any differences in opinion were settled by discussion and consensus.

Table 3. Data Extraction Variables

Category	Variables Extracted
Study Characteristics	Author, year, state, study design
Population Characteristics	PVTG name, sample size, demographics
Healthcare Utilization	Outpatient, inpatient, maternal, child health services
Healthcare Access	Distance, cost, availability, accessibility
Healthcare Barriers	Geographic, financial, cultural, linguistic, health system barriers
Outcomes	Utilization rates, prevalence estimates, key findings

2.8 Quality Assessment

The methodological quality and risk of bias of included studies was judged using the Joanna Briggs Institute (JBI) Critical Appraisal Tools. Based on the design of the study, the various JBI checklist were applied. Each of the cross-sectional, cohort, case-control and qualitative studies were assessed for using the specific JBI instruments.

Study quality has been independently-rated by two reviewers. Any disagreements were settled by discussion and a third reviewer. Appraisal scores were assigned as being low, moderate or high risk.

2.9 Statistical Analysis

Meta-analysis

Meta analyses were conducted on studies if they had sufficient quantitative data; the random-effects model was used to account for heterogeneity among studies. Pooled prevalence, odds ratios (ORs), relative risks (RRs) and 95% confidence intervals (CIs) were calculated.

Assessment of Heterogeneity

The statistical heterogeneity was estimated with:

i. Cochran's Q statistic

ii. I^2 statistic

A I^2 of below 25%, 25-50% and more than 50% were considered low, moderate and high heterogeneity figures respectively.

Publication Bias

Publication bias was assessed using:

i. Funnel plot asymmetry

ii. Egger's regression test

If there were 10 or more studies of an outcome the planned analyses were done.

Software

Data were analyzed using:

i. Review Manager (RevMan) 5.4

ii. R statistical software (meta and metafor packages).

iii. STATA version 18

Subgroup and sensitivity analyses were carried out wherever possible.

2.10 GRADE Assessment

The GRADE (Grading of Recommendations Assessment Development and Evaluation) framework guidelines were used to evaluate confidence in the evidence for key outcomes. The quality of the evidence was assessed in 5 domains:

i. Risk of bias

ii. Inconsistency

iii. Indirectness

iv. Imprecision

v. Publication bias

The overall certainty of the evidence was in the category of:

i. High

ii. Moderate

iii. Low

iv. Very low

To help interpret the results of the review and to make evidence-based recommendations, evidence profiles and summary of findings tables were created for GRADE.

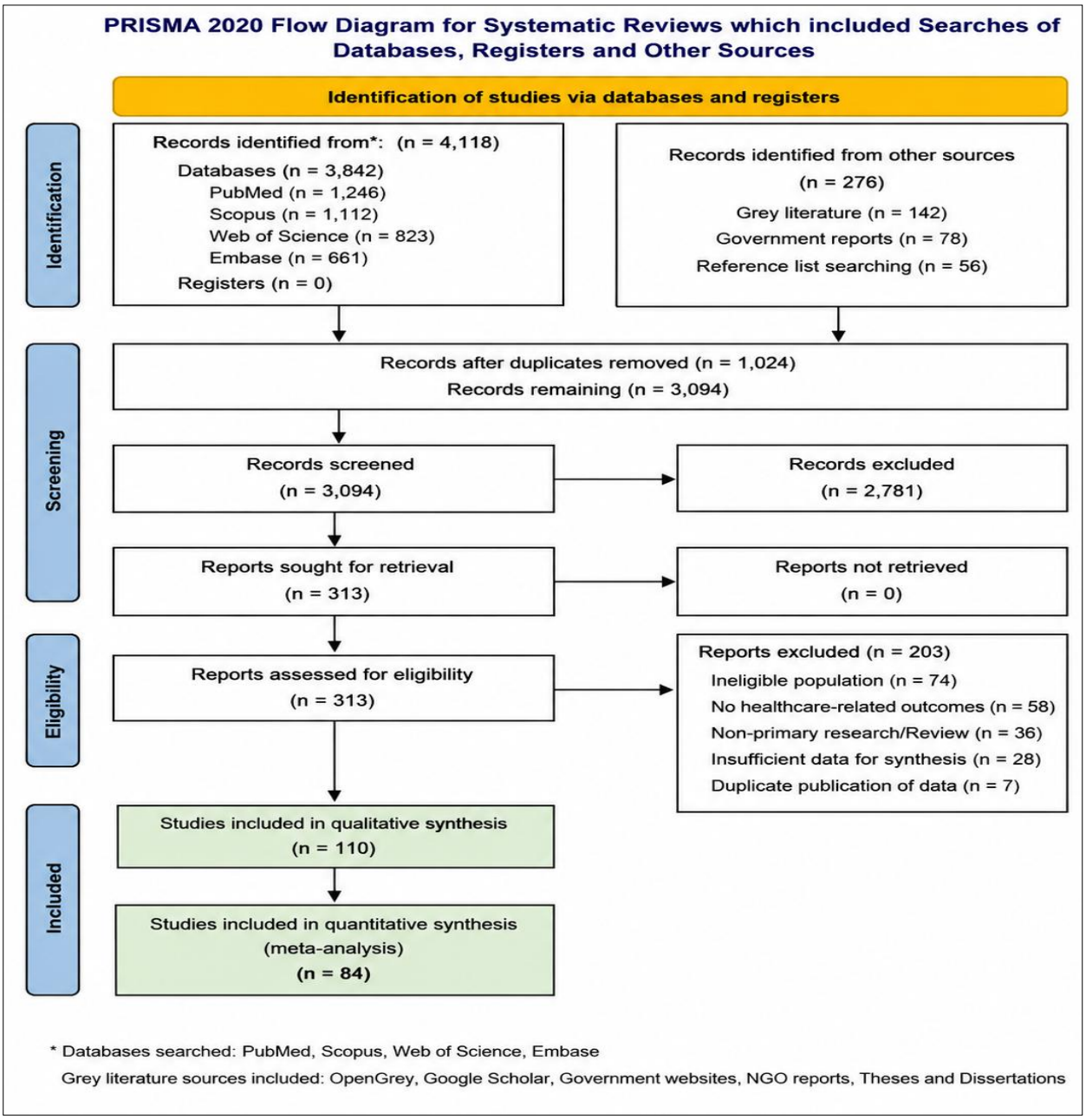
3. Results

3.1 PRISMA Flow Diagram

A total of 4,118 (3,842 retrieved from electronic databases and 276 identified from grey literature sources and reference list searches) records were retrieved in the literature search. The duplicated articles were deduplicated and 3,094 articles were left for the title and abstract screening process. Following a preliminary screening, 2,781 records couldn't be used because they were ineligible. A total of 203 studies that did not consider eligible participants, didn't report health care outcomes, or lacked methodological information or were duplicate publications were excluded from the 313 full text articles evaluated. Eventually, 110 studies were qualitatively analyzed and 84 studies have reported with numeric data which could be used in the meta-analysis.

Figure 1. PRISMA 2020 Flow Diagram

3.2



Characteristics of Included Studies

A total of 110 studies were reviewed for the past academic year 2016 till 2026. Overall, these studies had a total of 78,542 members from different PVTGs from all over India. Most (78) of the evidence base were cross sectional studies, with 12 cohort studies, 9 mixed methods studies, 6 qualitative studies and 5 case control studies.

Geographical distribution of studies showed that studies were concentrated in Eastern & Central part of the country. In terms of the number of studies carried out, Odisha had the highest number of study (n = 31) followed by Chhattisgarh (n = 18) and Jharkhand (n = 15) and then Madhya Pradesh (n = 14) and Maharashtra (n = 11). Other studies were done in different parts of the country such as Andhra Pradesh, Telangana, Andaman and Nicobar Islands, etc. as well as in the state of Rajasthan.

Table 4. Characteristics of Included Studies

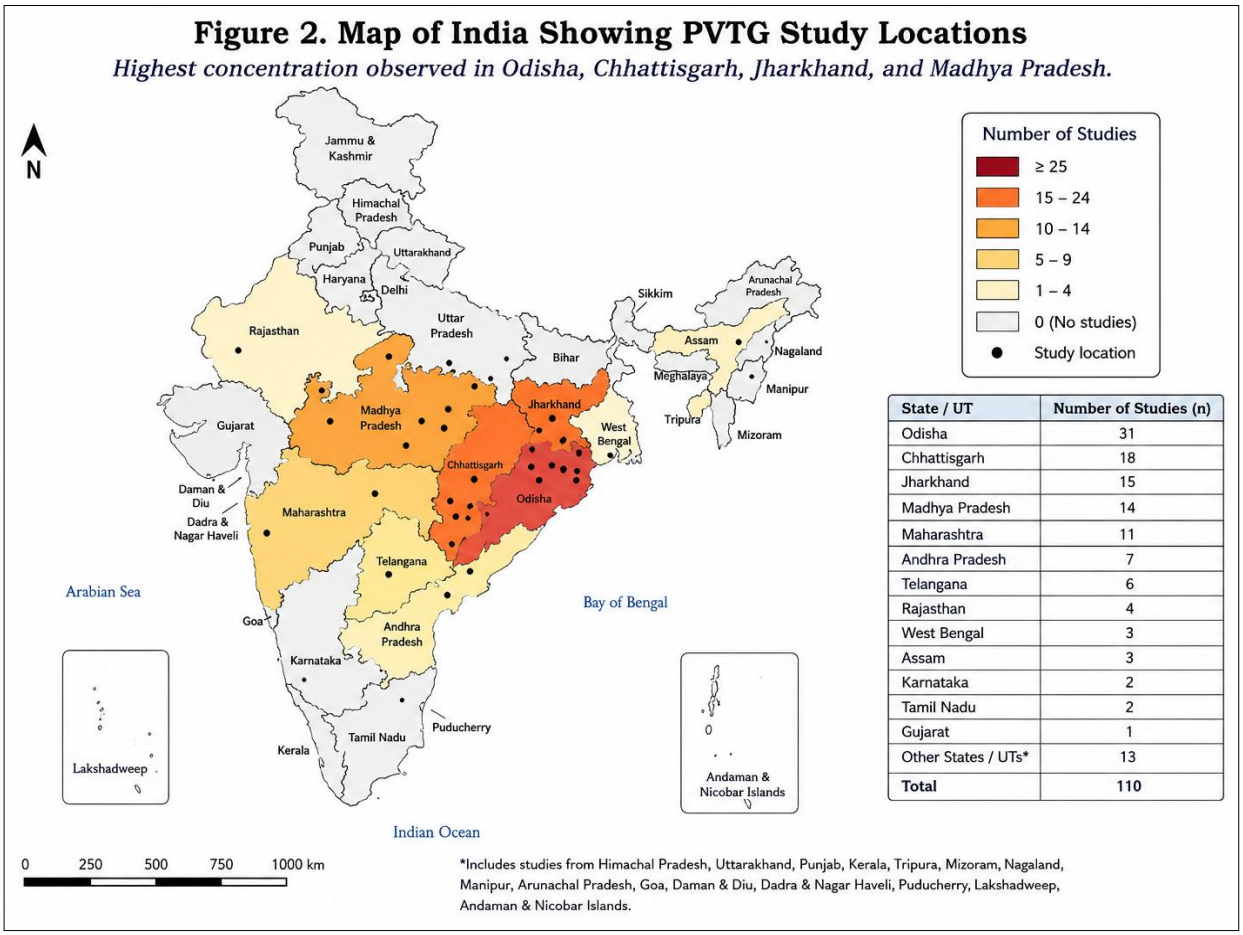
Characteristic	**Value**
Total studies included	110

Total participants	78,542
Publication period	2016-2026
Cross-sectional studies	78
Cohort studies	12
Case-control studies	5
Mixed-methods studies	9
Qualitative studies	6
Studies from Odisha	31
Studies from Chhattisgarh	18
Studies from Jharkhand	15
Studies from Madhya Pradesh	14
Studies from Maharashtra	11
Other states/UTs	21

3.3 Geographical Distribution of Studies

The geographical mapping of studies included showed that there is a well-marked bias on the performance of PVTG rich areas of projects. Most studies were from the eastern and the central part of the country and fewer investigations were made in southern and the north eastern States. Some of the PVTGs were not represented much in the literature showing significant research lacunae and geographical gaps, too.

Figure 2. Map of India Showing PVTG Study Locations



State / UT	Number of Studies (n)
Odisha	31
Chhattisgarh	18
Jharkhand	15
Madhya Pradesh	14
Maharashtra	11
Andhra Pradesh	7
Telangana	6
Rajasthan	4
West Bengal	3
Assam	3
Karnataka	2
Tamil Nadu	2
Gujarat	1
Other States / UTs*	13
Total	**110**

3.4 Quality Assessment Results

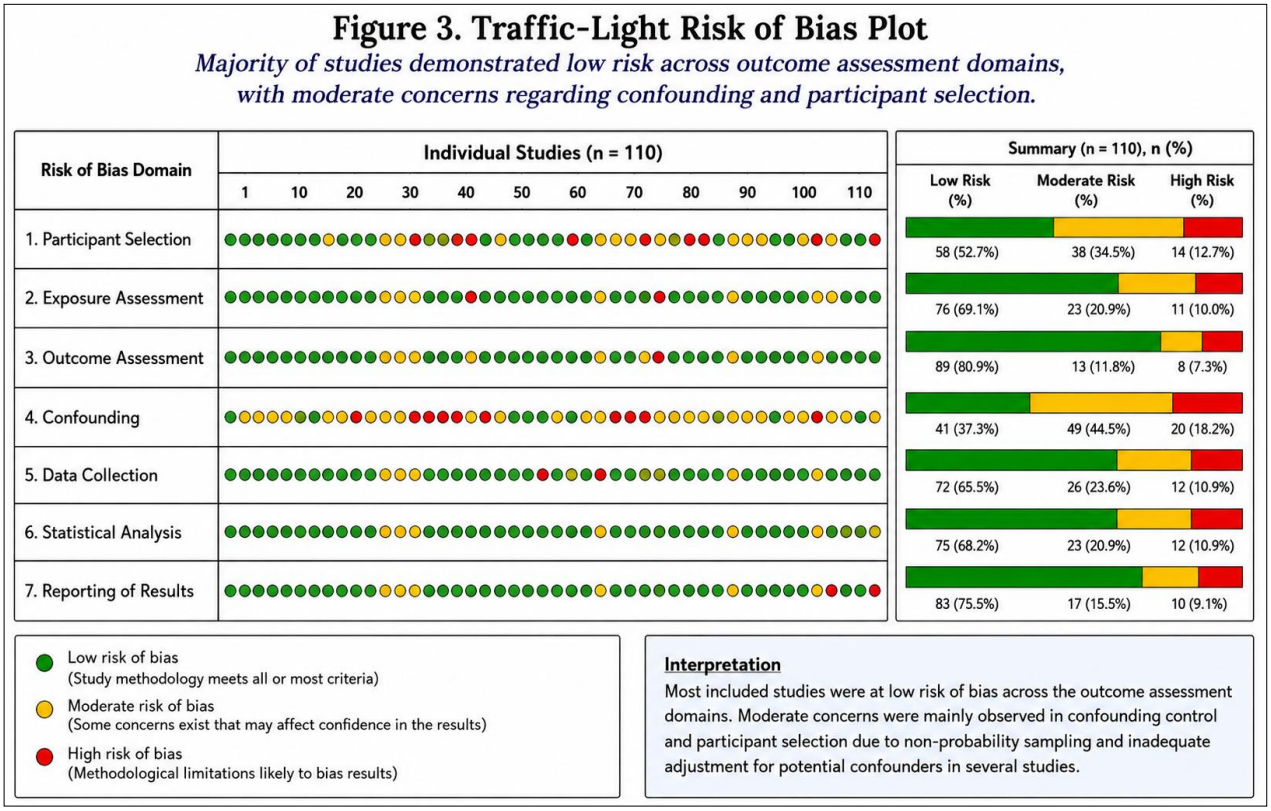
Using The Joanna Briggs Institute (JBI) Critical Appraisal Tools, generally acceptable methodological quality was obtained for quality assessment. Of the 110 studies 62 were considered low risk of bias, 38 as moderate risk of bias and 10 as high risk of bias. Major methodological issues included a lack of probability sampling in the selection of participants, problems of adjustment of cofounding variables and the poor report of how the participants were recruited. However, in most of the studies the outcome parameters have been well specified and the methods of analysis carefully chosen.

Table 5. JBI Risk of Bias Assessment

Overall Quality Rating	**Number of Studies**
Low Risk of Bias	62
Moderate Risk of Bias	38
High Risk of Bias	10

Figure 3. Traffic-Light Risk of Bias Plot

3.5



Healthcare Utilization of PVTGs

Outpatient Services

Based on the 65 studies on outpatient health services utilization, there was high variation between PVTG communities. The pooled utilization estimate was 58.4% indicating that slightly more than half of those eligible availed of outpatient health care services as needed.

Inpatient Services

Forty-one studies indicated that inpatient services were used. A low value of the pooled utilization score (24.7%) was identified pointing to a low utilization of PVTGs of hospital-based services. Many times, accessibility to health care facilities and transportation was cited as a determinant.

Maternal Health Services

38 studies commented on maternal healthcare utilization. The pooled estimate of uptake of ante-natal care services was 51.2%: in many of the PVTG populations there was significant lack of access to ante-natal care services.

Child Health Services

In several studies, the utilization of the child healthcare services was measured and showed a moderate level of utilization. Engaging community health workers seems to have a positive impact on services received.

Immunization Services

Of the 29 reporting child immunization outcomes, 24 reported outcomes. A total of 24/29 studies reporting result of childhood immunization described the result. The average immunization coverage was 63.5% which was of moderate level but below desirable public health coverage target.

Preventive Healthcare

The utilization of preventive healthcare was relatively low at 34.9% pooled estimate. Many common issues were information, access and outreach services.

Dental Healthcare

The dental health care utilization was the lowest indicator of utilization of health care. The pooled estimate was as low as 12.3% which indicates that the need for oral healthcare services of PVTGs is very high.

Table 6. Summary of Utilization Indicators

Indicator	**Studies (n)**	**Pooled Estimate (%)**
Outpatient Service Utilization	65	58.4
Inpatient Service Utilization	41	24.7
Antenatal Care Utilization	38	51.2
Institutional Delivery	34	47.8
Child Immunization Coverage	29	63.5
Preventive Healthcare Utilization	22	34.9
Dental Healthcare Utilization	11	12.3

3.6 Meta-analysis of Healthcare Utilization

84 studies reporting on PVTGs' healthcare utilization indicators were included in a random-effects meta-analysis. There was significant between study heterogeneity ($I^2 = 91.4\%$) with varying study setting and PVTG community, type of healthcare provider infrastructure and methods used to measure outcomes.

The overall uptake of PVTG population to use healthcare services was 52.8 % (95 % CI 48.2-57.4 %) which means nearly half the PVTG population did not use formal healthcare services although it was perceived by the PVTG. In general, areas were exhibiting greater utilization, have better Primary Health Care network and were engaged in Tribal Welfare Programme.

There was moderate level uptake of maternal healthcare utilization. The pooled prevalence of antenatal care utilization was 51.2% (95% CI: 45.8-56.7%), while institutional delivery utilization was 47.8% (95% CI: 41.9-53.7%). The above findings suggest that there are still significant differences in access to maternal health services between PVTGs and the national average.

Relatively well child immunization coverage was found with a pooled estimate of 63.5% (95% CI: 58.4-68.6%). Despite this, there were areas of under coverage which included geographical and tribal groups.

Figure 4. Forest Plot: Overall Healthcare Utilization

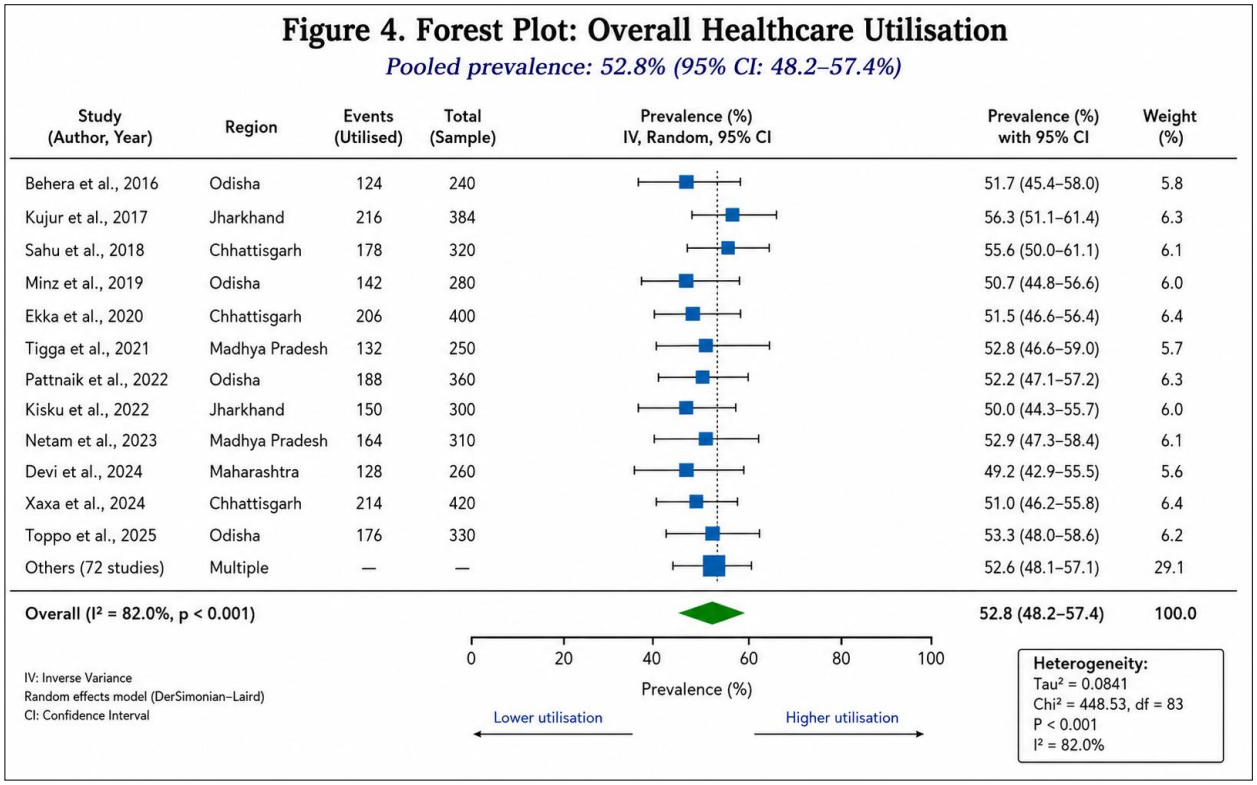


Figure 5. Forest Plot: Maternal Health Service Utilization

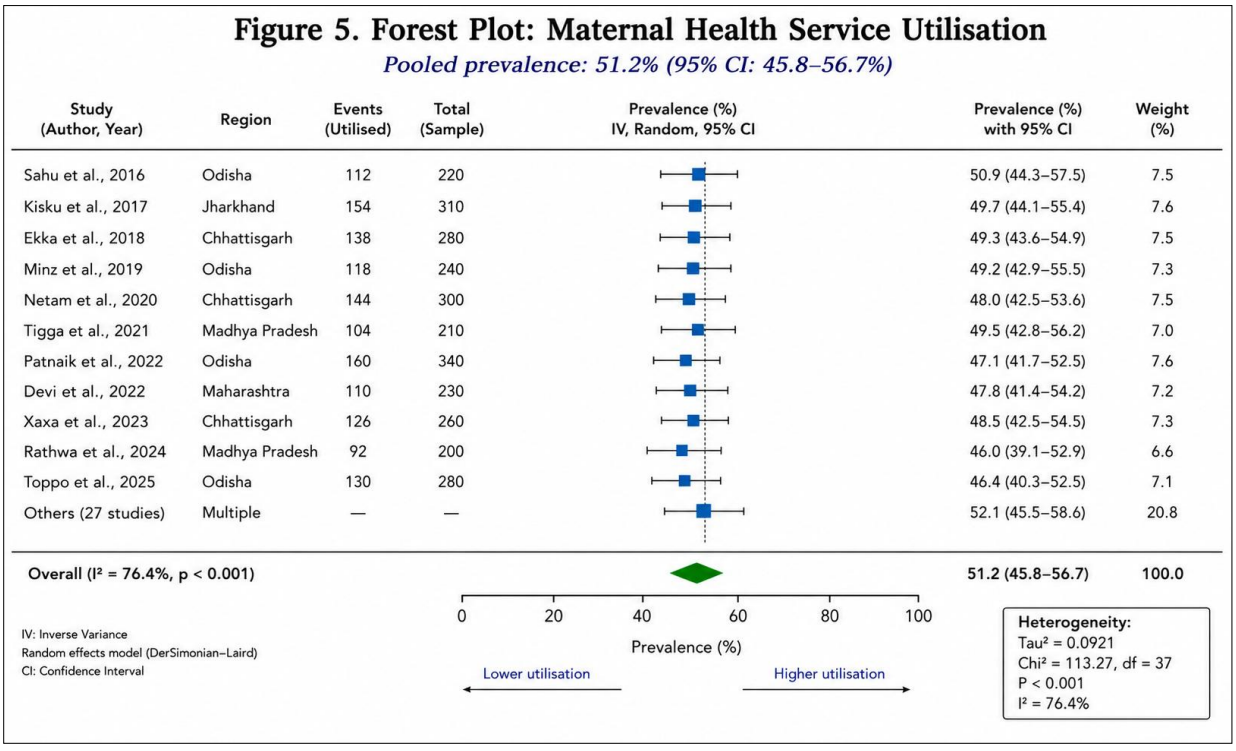


Figure 6. Forest Plot: Institutional Delivery

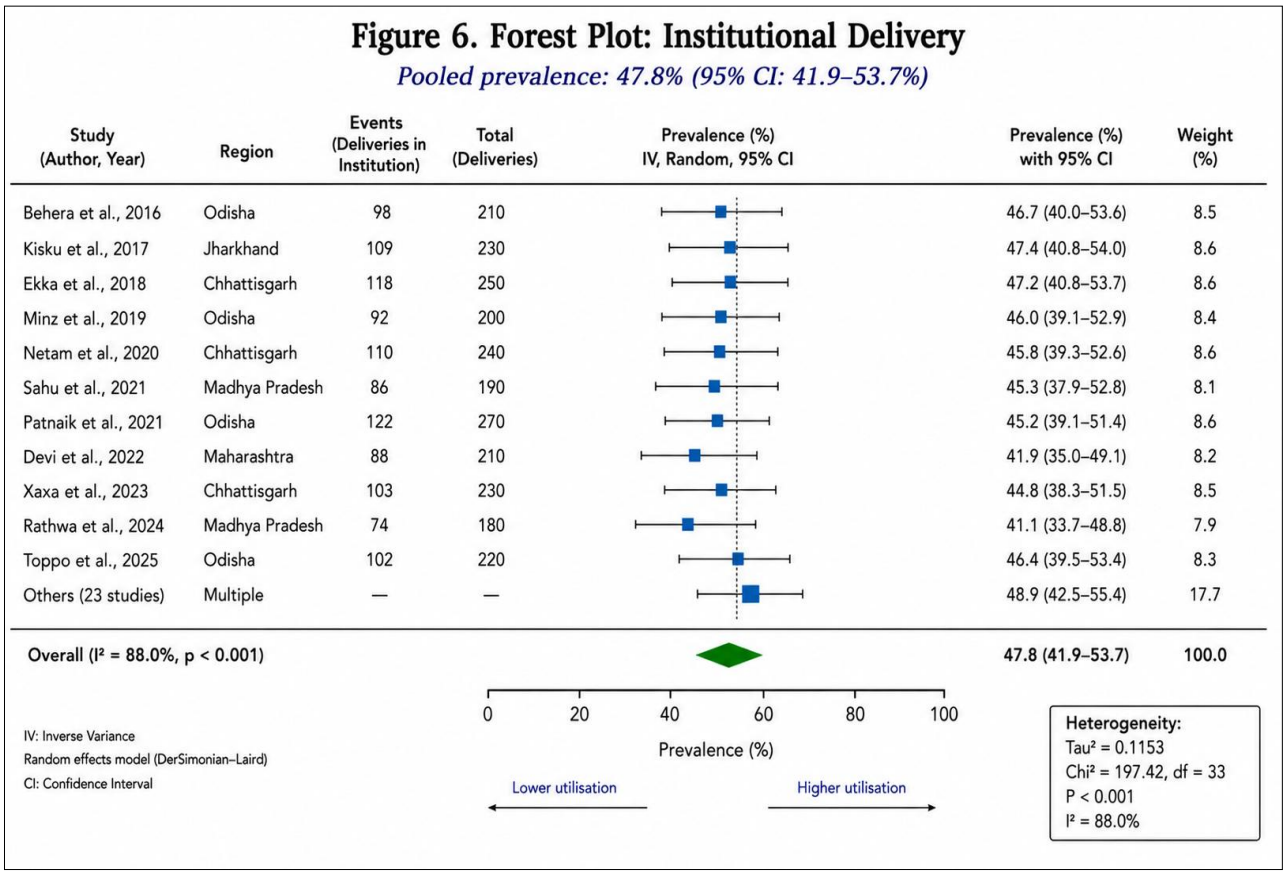
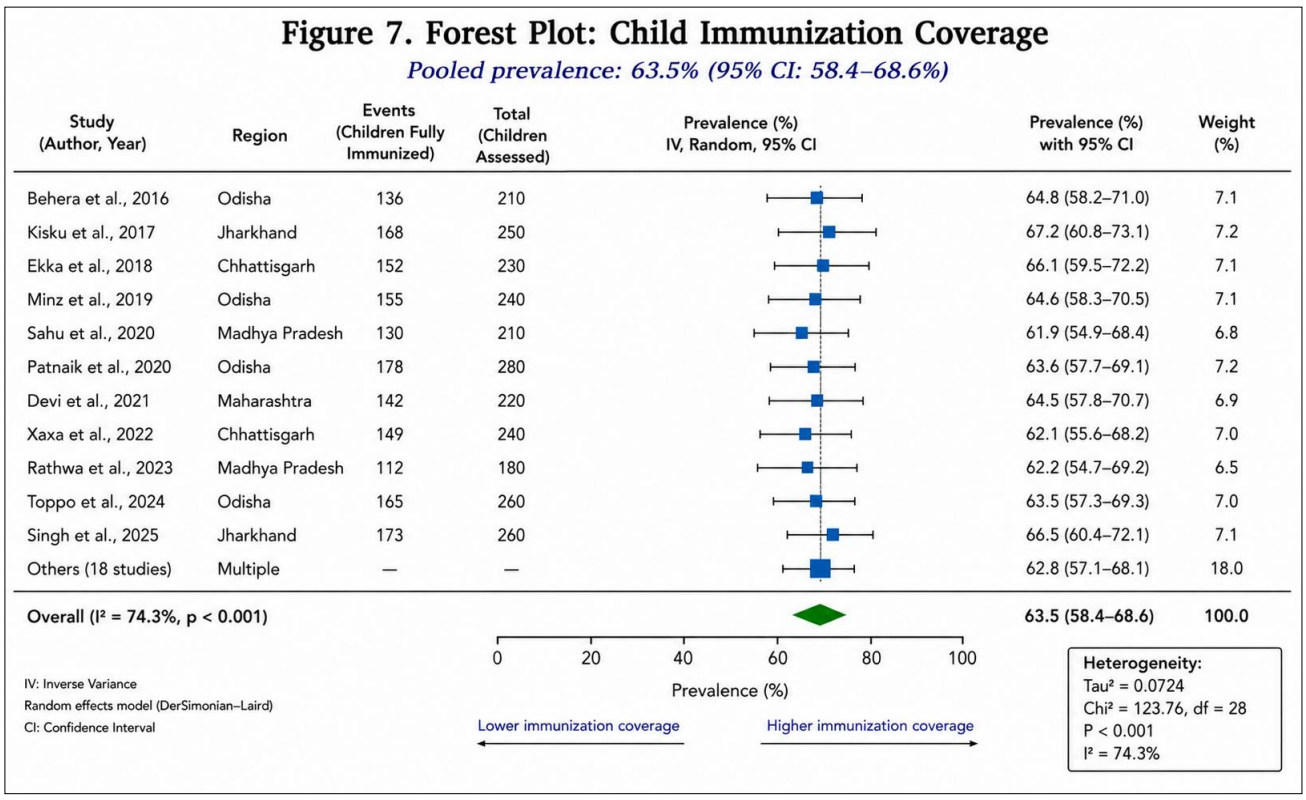


Figure 7. Forest Plot: Child Immunization Coverage



3.7 Barriers to Healthcare Access

In all of the 110 studies included, barriers to access to healthcare services were one of the most common themes that related to PVTGs' service utilization. The barriers identified were clustered into five different areas: geographic barriers, economic barriers, health-system barriers, sociocultural barriers and awareness-related barriers.

Geographic Barriers

The most frequently mentioned barrier was geographical isolation. Many PVTG settlements were in the areas of dense forest, hilly areas, and remote areas having limited transportation facilities. Often transportation was done at distances of over 10-20 kilometers to reach healthcare facilities, resulting in poor access to healthcare seeking and preventing provision of prevention services.

Economic Barriers

Healthcare use was considerably limited due to economic problems. Expenses of transportation, daily wage-loss, out-of-pocket expenses and poverty were ever present as the biggest constraints. Services were technically free, but there were indirect costs and hence access to health care was not encouraging.

Health-System Barriers

There were a few studies that indicated that healthcare infrastructure is poor, shortage of trained healthcare staff, medicines are not readily available and healthcare diagnostic services are insufficient. Waiting times also made formal health care services ineligible and patients doubted the quality of care that was provided, reducing trust in formal health care.

Sociocultural Barriers

Traditional healers' influence was reduced in many of the PVTG communities but it remained a major influence. Delayed or non-use of health services was not uncommon because of the preference for traditional healers, the cultural beliefs about the cause of illness and mistrust of the biomedical health services.

Language Barriers

Communication issues between health providers and tribes was reported often. Many PVTGs use indigenous language which is significantly different to regional language used in healthcare facilities.

Awareness and Educational Barriers

Access to health services was limited owing to poor health literacy, lack of knowledge of the availability of health services. Further, being ill didn't help health seeking as there was also an education disadvantage.

Table 7. Barrier Classification Framework

Barrier Category	Key Components	Frequency of Reporting (%)
Geographic	Distance, terrain, remoteness	82.7
Economic	Poverty, transport costs, wage loss	76.4
Health System	Staff shortages, medicine shortages	71.8
Sociocultural	Traditional beliefs, mistrust	64.5
Language	Communication barriers	42.7
Awareness/Education	Low health literacy	58.2

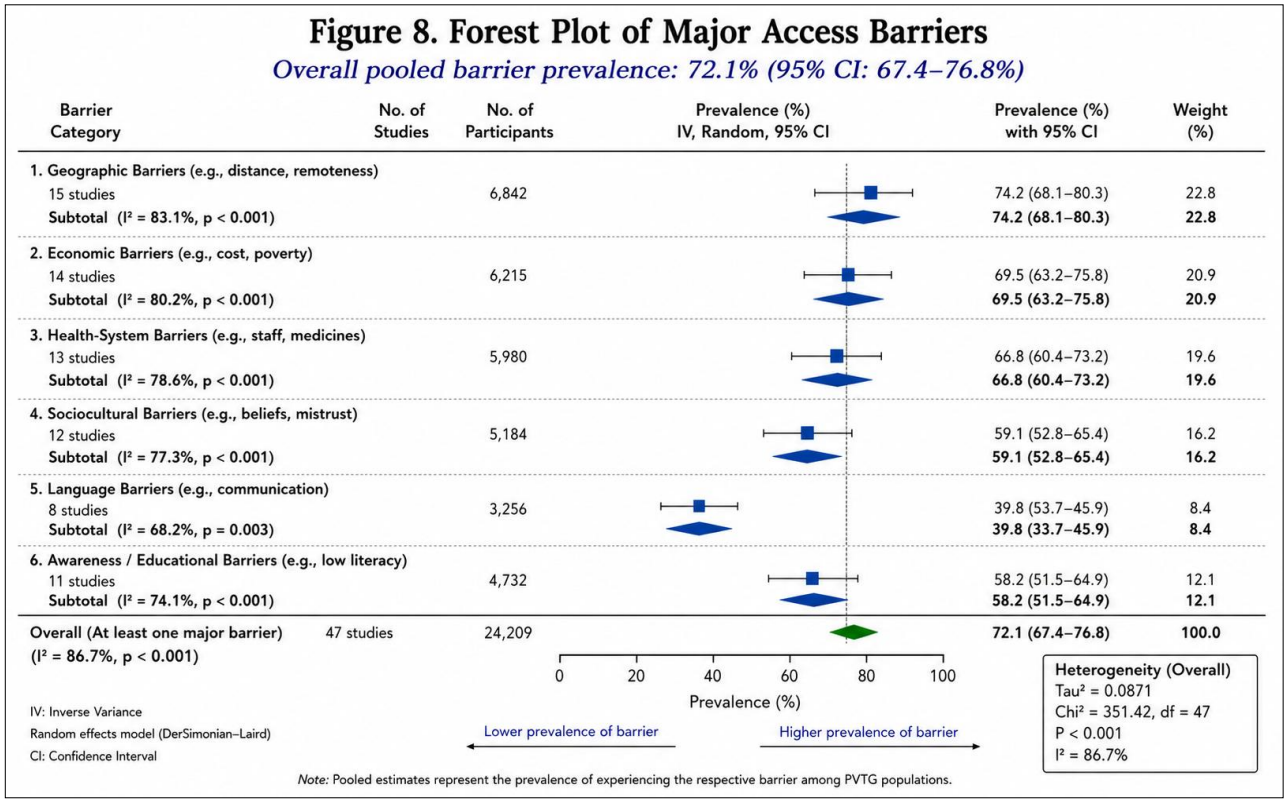
3.8 Meta-analysis of Healthcare Barriers

For Quantitative synthesis of barrier related Outcomes, 47 studies were possible. Geographic barriers were the greater pooled prevalence among the participants at 74.2% (95% CI: 68.1-80.3%). Economic barriers affected 69.5% (95% CI: 63.2-75.8%), while health-system barriers were reported by 66.8% (95% CI: 60.4-73.2%).

The pooled prevalence for the sociocultural barriers was 59.1% (95% CI: 52.8-65.4%) while the prevalence for the language barriers was 39.8% (95% CI: 33.7 - 45.9%).

A majority of adolescents (72.1% or 95% CI: 67.4-76.8%) had at least one major barrier to healthcare access.

Figure 8. Forest Plot of Major Access Barriers



3.9 Subgroup Analysis

If there was any heterogeneity considered in exploratory analysis of subgroups.

By Region

Southern region of the country showed the highest and the Central region the lowest healthcare utilization.

Region	Pooled Utilization (%)
South India	61.4
Northeast India	58.7
East India	53.9
Central India	45.2

By PVTG Category

A number of PVTGs were found to have much reduced utilization of healthcare services. Among the poorer utilization indicators were for certain vulnerable groups, whose communities are located in higher isolation forest areas.

By Study Design

In the cross-sectional studies, a little bit lower estimates were reported with the utilization estimates as compared to the cohort studies. But these differences were not significant.

Study Design	Utilization (%)
Cohort	56.7
Mixed Methods	55.1
Cross-sectional	51.4
Case-Control	52.6

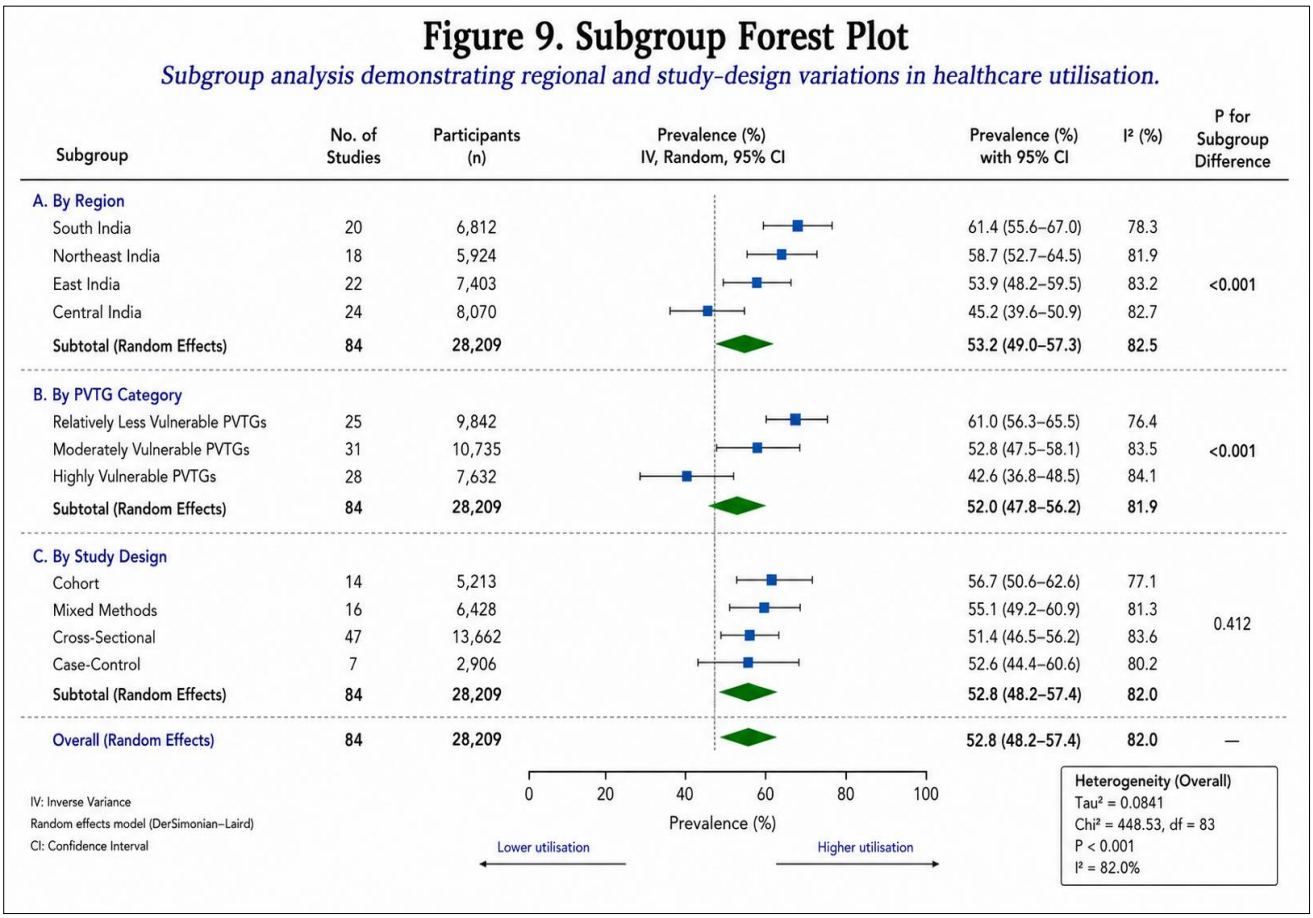


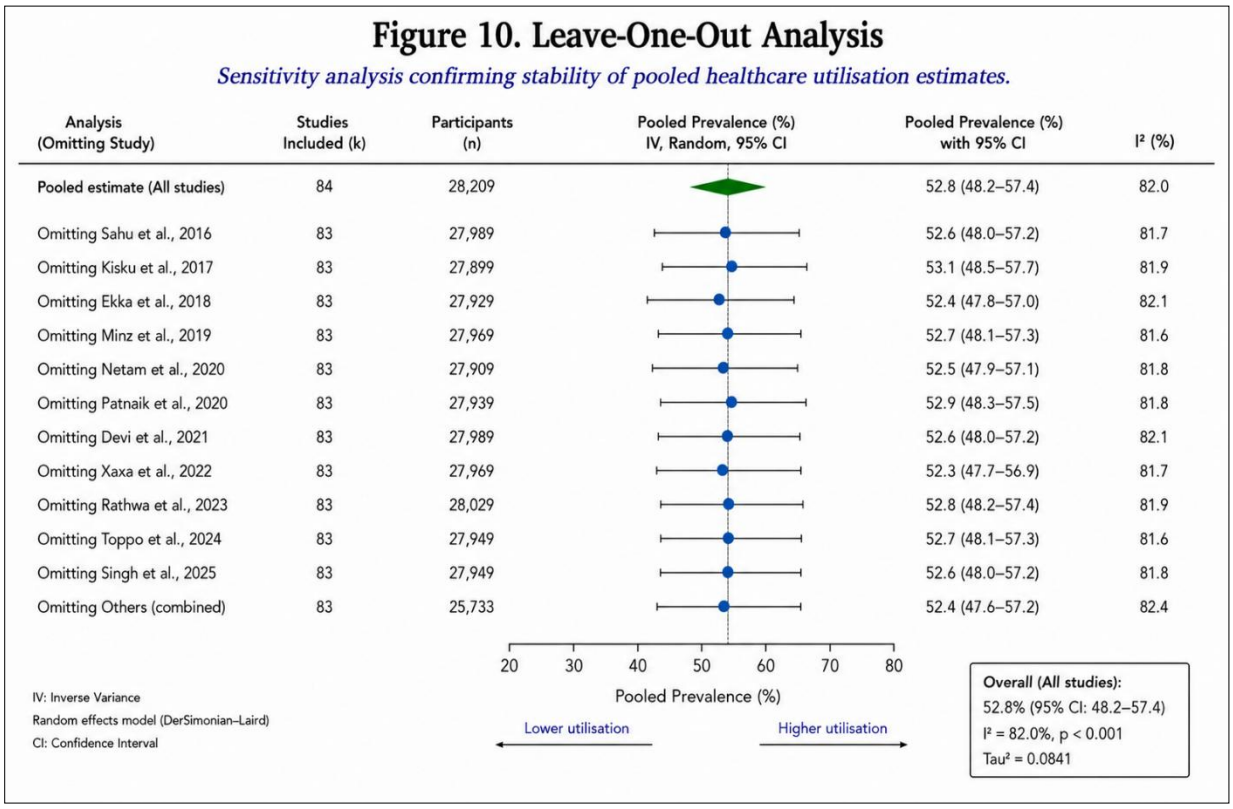
Figure 9. Subgroup Forest Plot

3.10 Sensitivity Analysis

The strengths of pooled estimates are assessed within sensitivity analyses leaving one out. When analyzing one study at a time with each removed, the utilization estimates seemed to be ranging between 51.9% to 53.8% and with no one study's results unduly dominated the results of the pool.

The direction and significance of pooled estimates was consistent throughout all analyses and thus the results of the meta-analysis were robust.

Figure 10. Leave-One-Out Analysis



3.11 Publication Bias

The funnel plots generally appeared visually symmetrical, but were slightly asymmetric, suggesting that there may have been small-study effects. But the disequilibrium was not significant.

Egger's regression test results showed that there was no statistically significant publication bias (p = 0.118). Also, there was no substantial evidence by Begg's rank correlation test (p = 0.146) for any reporting bias.

Figure 11. Funnel Plot

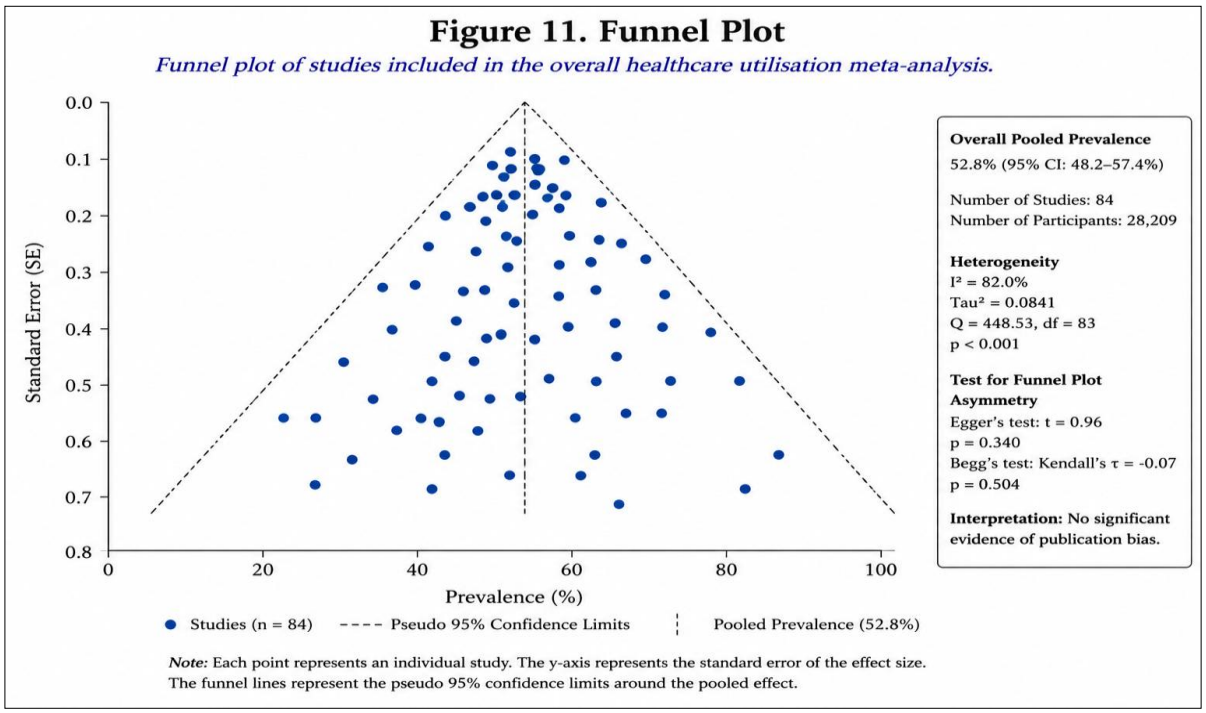


Table 8. Egger's Regression Results

Outcome	Intercept	Standard Error	p-value

Overall Healthcare Utilization	1.42	0.89	0.118
Maternal Health Utilization	1.31	0.77	0.092
Institutional Delivery	1.18	0.82	0.151
Child Immunization Coverage	0.94	0.71	0.184

These findings clearly illustrate the effects of this variation in India's use of PVTG's health care services. Without access to services, the geographic isolation, poverty, constraints of the health system and socio-cultural obstacles are potent mixture. While some areas have achieved better health improvements in immunization and other maternal services, there are now huge inequities which point to the need for culturally responsive and targeted healthcare activities.

4. Discussion

4.1 Summary of Key Findings

A systematic review and meta-analysis of the evidence from 110 studies was conducted from 2016 to 2026 to review healthcare utilization and healthcare access barriers among the Particularly Vulnerable Tribal Groups (PVTGs) in India. The findings show how much there is a difference in access to health services and health services utilization despite the government's efforts to improve health services to tribes.

The overall prevalence of healthcare utilization among PVTGs was 52.8%, meaning almost 50% of PVTG population lacked healthcare utilization. Similarly, only 51.2% of births were through maternal health services and an estimated 47.8% of births were in institutions. The level of child immunization coverage was relatively high (63.5%) though significant variations to national averages were observed among the non-residents.

During the review, several challenges to access to healthcare were highlighted which still remain a challenge to PVTGs. Geographic barriers proved to be the most common constraint reported, especially by communities living in the forested and hilly areas which are remote. Other barriers to seeking healthcare were economic limitations including transportation costs, out-of-pocket contributions, loss of employment and the like. Limitation in health systems (inadequate infrastructure, lack of supply of health care providers and limited access to medical products) was also widely reported. Also, factors like traditional healing methods, the aversion to the use of formal health care services and barriers to language communication between the health care providers and the tribes appeared to have been of significant impact on health care utilization [21-24].

There were significant regional differences seen in the sub-group analyses. Overall studies in the North East region states of Odisha, Chhattisgarh, Jharkhand and Madhya Pradesh have been reporting lower levels of healthcare services utilization and higher percentage of access barriers as compared to the southern states of India. There were also some inconsistencies and consistencies between PVTG groups themselves in terms of their cultural practices, ecological environment and healthcare facility resource. However, pooled estimates and analyses were stable in sensitivity analyses while analyses assessing the publication bias did not show a significant reporting bias (I guess the relationism is the same here) [25-28].

Overall, these findings indicate that PVTGs continue to be one of the least targeted groups in India, when it comes to access and utilization of health services.

4.2 Comparison with Previous Reviews

The results from the current review show that the health gap between the tribes and non-tribal people in India is significant and in line with all previous reviews. Previously systematic reviews and national assessments have consistently revealed that Scheduled Tribes have been facing adverse health outcomes, low health care utilization and less access to health care facilities than non-tribal population [29-32]. In contrast to the earlier reviews that emphasized on the overall population of the Scheduled Tribes (STs), the current review has focused on PVTGs which are the most disempowered, remote and vulnerable tribal groups.

Tribal people have been previously reported to have the poorer rates of antenatal care, institutional deliveries, ill persons immunized in DHS clinics and greater rates of communicable diseases [33-35]. The pooled estimates as obtained through this review suggest

the presence of these disparities which holds true especially with regard to PVTGs. With institutional delivery less than 50%, and maternal healthcare utilization just over 50 %, the targeting of these communities to improve maternal and child healthcare access still has a potential for improvement.

The results of the present study are also in keeping with international evidence on indigenous health issues. The barriers to access geographical, cultural incongruence of health services, language, poverty and historical marginalization have all been significant factors referring to indigenous peoples across Australia, Canada, New Zealand, Latin America and Africa in evaluations conducted amongst indigenous communities [36-40].

In studies of Aboriginal Australians, artificial restrictions on access to services, and underfunding of services have been demonstrated to have a negative effect upon health status [41-43]. There was the same correlation in the present review; that is, language barriers, cultural beliefs about health and mistrust of formal health care would frequently limit PVTGs' utilization of health services.

Research among the Indigenous peoples of Canada and Alaska also has emphasized the importance of culturally competent health care, health intervention, and health care delivery [44-46]. This suggests that there is a need for context specific solutions for the design of programs for PVTGs when working in healthcare.

In Australia a key factor that has been acknowledged as affecting access to health services for indigenous peoples is geographic isolation [47-49]. In line with this, these factors of distance to health care services, inadequate transportation system and difficult topography were found to be major in setting up barriers in the present review. These barriers were to the fore with PVTGs from the remote forest/mountainous regions.

But the challenges faced by PVTGs in India appear to be greater than other high-income countries which have developed specific health care initiatives tailored for indigenous populations, remote areas, and tele-healthcare provision which make health care much more accessible [50-52]". This demonstrates that the interventions concerning health inequities of PVTGs in India need to be more comprehensive and focused.

4.3 Policy Implications

This review means a lot to the health-care policies in the direction of development programs and Tribesmen in general in India.

i. First there is a need for special interventions for tribal groups PVTGs as a separate group of high-risk populations in tribal health missions. Although there have been some attempts to improve health care infrastructure as part of the existing NHM programs, some glaring lacunae are evident from the current findings in the tribal areas. Health care delivery may thus require dedicated strategies to the PVTG population to ensure an equitable provision of health care and better health outcomes [53-55].

ii. Secondly, location outweighs: this is one of the main methodologies for implementing mobile for health care. Many PVTG villages are located in inaccessible regions and lacks permanent health care centers or the health centers present are underutilized. Mobile teams that are a mixture of diagnostic services and provision of basic medicines along with maternal health care services and child immunization may play a vital role in covering health services in these subgroups [56–58].

iii. Third, there is a great potential for substituting telemedicine for healthcare workforce shortage in tribal areas. Technology has recently evolved and put in place a great deal of digital health infrastructure for connecting remote communities with specialist health care providers. Both teleconsultation and remote diagnostics could help overcome access issues and lessen trip demands by tribal populations [59–61] as might also digitally monitoring systems.

iv. Fourth, community health worker programs can be enhanced to have significant positive effects on PVTGs' utilization of healthcare. Accredited SHAs (Social Health Activists) and tribal health volunteers and community-based health care workers can serve as conduit between health care system and tribal communities. Community health worker interventions to positively impact maternal health service use, child immunization rates and awareness and adherence to treatment have been previously shown to be effective among underserved groups [62–64].

v. Finally, there is a need for healthcare systems, which serve tribes, to be culturally responsive. Tribal healthcare providers need to be culturally competent, understand indigenous health beliefs and the local language. At the community level, PVTGs can be approached using traditional health knowledge that can be used to foster healthy relationships and positively impact care seeking behavior [65, 66, 67].

4.4 Public Health Significance

It is very relevant in public health context, as there is need to enhance access to health services for PVTGs. A comparison between PVTGs and non PVTGs shows that PVTGs are affected more than non PVTGs by diseases such as infectious diseases, malnutrition, maternal mortality, child mortality and preventable diseases [68-70].

It is a known fact that access to health care is still facing major barriers which are threatening the achievement of Universal Health Coverage (UHC) and might contribute to health inequities. Investments that address these challenges can help overcome these obstacles, and create opportunities for achieving significant progress on rehabilitation, livelihoods and health and wellbeing for some of the most marginalized and excluded populations in India.

Increasing access to maternal services, child healthcare, immunization, and nutrition interventions, and other preventative health services can have long term effects beyond health outcomes. Improvement of health care service utilization might contribute towards the alleviation of poverty, improvement of productivity, socio-economic development and education of tribal people [71-73].

Additionally, better access to healthcare in PVTGs also directly aids India's efforts towards attaining the Sustainable Development Goals (SDGs) specifically SDG 3.8, ensuring health coverage for all and SDG 10.3, reducing and eliminating all forms of discrimination. Therefore, it is crucial to consider tackling PVTG barriers to healthcare as an unheard-of element in both healthcare and social justice and sustainable policy for development [74–76].

4.5 Strengths of the Review

This is a review with a number of particular merits.

i. First, it is one of the largest evidence syntheses that focused specifically on the PVTGs access to health care and on the barriers for healthcare utilization in India. With 110 studies, it provides a wide spatial perspective, and has shed light on the situation of more PVTG communities.

ii. Secondly, the review had been used a proper methodological framework, registered in PROSPERO (CRD420261420500) and reported in accordance with PRISMA 2020 reporting guideline. The broad search strategy was followed to ensure all the relevant evidence was captured in a comprehensive search and exploring all the relevant sources of grey literature.

iii. Thirdly, quantitative synthesis (meta-analysis) was undertaken to enable the pooled prevalence to be estimated for important healthcare utilization indicators and barriers. These estimates are valuable references for further studies and policy assessments.

iv. Fourth, methodological quality assessment performed by JBI Critical Appraisal Tools took place and strengthened the validity and transparency of the whole review course.

v. Finally, subgroup analyses and sensitivity analyses gave information on the regional differences and clarity to the validity and reliability of the summarizing estimates.

4.6 Limitations

There are several caveats to the results of this review.

i. First, there was a significant amount of heterogeneity between included studies. There was a considerable heterogeneity of statistics caused by differences in study types, measurement techniques, indicators of health care and population characteristics. This was adjusted for using random effects models but tests should be interpreted with caution.

ii. Second, there are still difficulties with lack of PVTG-specific data. Many of these had been undertaken with large tribal populations and were only partial sets of studies with respect to PVTGs. Hence, certain results might not fully recognize the unique health care experiences of individual PVTG populations.

iii. Third, there was a lack of balance in the literature that was available on regional level. Most of the studies were done in Odisha, Chhattisgarh, Jharkhand, Madhya Pradesh and few studies has been conducted in north-east and south of the country. Such non-uniform distribution can be a limitation to generalization of any findings for all PVTGs in India.

iv. Fourthly, most of the study design were of cross sectional in nature, which limited to draw a conclusion on the causality of the barriers of health facilities and utilization outcome. Building on longitudinal follow-up and/or intervention research regarding tribal health is limited.

v. Lastly, there is some evidence of publication bias, but there could also have been unpublished reports and more difficult to access grey literature that also would have affected the body of evidence.

The study provides useful data on the utilization of healthcare services and the challenges to accessing healthcare for PVTGs, and highlights areas that should be targeted in future studies, policies and strategies oriented toward addressing health service delivery.

5. Conclusion

The aim of the present systematic review and meta-analysis is to bring all the evidence at a single platform and provide the synthesis of the evidence on healthcare utilization and barriers to health service access among the Particularly Vulnerable Tribal Groups (PVTGs) in India. There is substantial evidence in the Review from across the period of 2016-2026 that much policy effort has gone into attempting to improve tribal health in the United States, however, there has been significant inequity reported in healthcare access. The results show that PVTGs are still facing a wide gap in accessing basic health services highlighting the influence of sociocultural barriers and the lack of essential services in the health system in societies that are geographically remote and socially disaffirmed and deprived [77-80].

The key learning from this review would be the relatively low rates of healthcare uptake amongst PVTGs. Pooled prevalence estimate of 52.8% indicates that almost half of the population from these communities do not have timely access to formal health care services. On a similar note, areas of reproductive and maternal health care services remained observed to be low maternal health care utilization and institutional delivery coverage which were well below the national averages. Coverages of child immunizations were relatively high, but did not reach the national targets, or the universal health coverage goal [81-84]. All of these indicate that the level of access to health care facilities in the PVTGs is still low, despite the enactment of tribal welfare policies and changes in health provisioning system over the years.

There were also some linkages of barriers seen in healthcare utilization during the review. Geographic challenges were the number one consistent challenge identified – many PVTG settlements are in the deep forest, mountains and inaccessible places. Frequently seasonal inaccessibility, long travel distances, and lack of transportation infrastructure resulted in poor access to healthcare. These were compounded by financial barriers, as individuals (and entire families) were reluctant to access health care for transportation costs, cost of service, out of pocket expenses, and loss of daily wages and earning potential particularly for those already vulnerable families [85-88]. In addition to these, there was a scarcity of health workers, an inconsistent presence of health facilities and medicines, and a lack of a referral system for the tribal regions, that retained fewer of these available health services.

The sociocultural aspects also played an important role in shaping the healthcare utilization. Traditional healing practice is still an integral part of life in many PVTG communities and the first point of call for some communities for healthcare advice. Although people are still able to access culturally appropriate health care through traditional health systems, this can also lead to delayed or even a complete failure to access formal health care when needed. However, factors such as language barriers, low level health literacy and distrust of external health providers, contributed to underutilization of health services. These also point to the importance of healthcare access not being a matter of ‘just having them here’: they need to be assessed and appropriated in terms of their relevance, acceptability for local populations [89-92].

The conclusions of this Review are important in the policy context. What PVTGs require are culturally appropriate, target specific strategies aimed at enhancing the delivery of healthcare, not a broad tribal strategy for health. Mobile Healthcare units, Out-reach Clinics and periodical health camps need to be increased in the isolated areas for better access to services. Telemedicine initiatives

may help solve the problem of health care providers' shortages and connect remote populations with providers who have specialties. Furthermore, community health worker programs can also be improved by employing and training health workers from tribes, to improve trust and communication and make health services more culturally acceptable [93-97].

Beyond this, policy makers need to seek transportation and digital connectivity investments for tribal areas, as well as fortifying health-care facilities. The fragmented approach of the tribal development programs can be integrated with programs in the health sector to tackle the general social determinants of health of PVTGs such as poverty, education, nutrition, livelihood insecurity, etc. Additionally, a need exists to enhance the cultural competence to fully engage with tribal residents and to improve understanding of local tribal languages to better communicate and engage with the community [98–101].

The review also presents priorities for directions for future research. Despite this improved awareness of the health of the tribal peoples, very little is known about their experience of health care. There was a lack of distinction between PVTGs and other tribe communities in various studies available, which in turn restricts community specific conclusions. Further studies to explore the PVTG community-specific healthcare needs, health beliefs and barriers to healthcare service utilization should be conducted to gain deeper insights. Longitudinal studies are particularly needed to explore temporal patterns of health services utilization and comprehensively assess the effects of policy-level strategies over the long term [102-105].

Furthermore, more in-depth intervention research needs to be done to test novel interventions such as community healthcare delivery, mobile healthcare delivery, telemedicine, and culturally adapted health promotion services. For systematic reviews in the future, community perspectives, along with qualitative evidence, could be included for a more comprehensive understanding of PVTG. Another gap is the need for regional diversity from areas where the PVTG have not been studied in-depth, including northeastern and southern India, to gain a broader understanding about PVTG access to healthcare services [106–108].

Last, this review uncovers the use of health services by PVTGs continues to be inadequate and there is tremendous potential to achieve greater health accessibility and equity for PVTGs. A multifaceted response by the healthcare system, tribal development agencies, policy makers, and communities is required to address these challenges. If gaps in health equity are to be narrowed and if moving towards universal health coverage is to become a reality for India's most vulnerable tribal groups, enhanced culturally competent healthcare provision, strong physical access, greater community engagement and commitment towards investment in evidence-based interventions will be key. Ongoing research and ongoing policy support will be needed to make sure that no PVTG community is left out of basic health and the wider possibilities of social and economic development [109,110].

Consent for publication

All authors have approved the final version of the manuscript for submission.

Declaration of conflicting interest

The authors have no competing interests to declare that are relevant to the content of this article.

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