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## REVIEW ARTICLE

## A systematic review and thematic synthesis of qualitative studies on maternal emergency transport in low- and middle-income countries

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## ABSTRACT

**Background:** Most maternal deaths are preventable with emergency obstetric care; therefore, ensuring access is essential. There is little focused information on emergency transport of pregnant women. **Objectives:** The literature on emergency transport of pregnant women in low- and middle-income countries (LMICs) was systematically reviewed and synthesized to explore current practices, barriers, and facilitators for transport utilization. **Search strategy:** MEDLINE, EMBASE, BNI, Cochrane Library, CINAHL, African Index Medicus, ASSIA, QUALIDATA, RHL, and Science Citation Index (inception to April 2012) were searched without language restriction. **Selection criteria:** Studies using qualitative methodology and reporting on emergency transportation in LMICs were included. **Data collection and analysis:** Thematic framework and synthesis through examination and translation of common elements were used to analyze and synthesize the data. **Main results:** Twenty-nine articles were included. Eight major themes were identified: time for transport; transport options; geography; local support; autonomy; culture; finance; and ergonomics. Key issues were transport availability; transport speed; terrain; meteorology; support; dependence for decision making; cultural issues; cost; and lack of safe, comfortable positioning during transport. **Conclusion:** Themes should be appreciated within local contexts to illuminate barriers and facilitators. Potential solutions include motorcycle ambulance programs, collaboration with taxi services, community education, subsidies, and vehicle maintenance.

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## 1. Introduction

Transport and health are inextricably linked, with transport services relating to numerous aspects of healthcare. Transport systems ensure attendance of healthcare providers and adequate medical supplies. Numerous reports have suggested mobility and transport as key requirements and determinants for health [1].

In many low-income countries, less than 1% of the population has access to conventional emergency transport (e.g. ambulance) [2]. A shortage of vehicles means that few people have access to transport for work or health purposes, even though transport systems were recognized as a fundamental human need 3 decades ago. For many, access to transport is not within easy reach; in Ethiopia, approximately

half of rural households were reported to travel distances greater than 15 km for public transport [3].

Most births in low-income countries occur outside of health facilities [1] and, as most obstetric complications are unpredictable, timely access to emergency care is essential for reducing deaths. Transport has a critical role in achieving Millennium Development Goals 4 and 5 (which include reducing child and maternal mortality, and achieving access to healthcare), targeting the second delay of “reaching care.” Research on transport in low- and middle-income countries (LMICs) often relates to pollution or the spread of communicable diseases. There is little focused and rigorously evaluated research on emergency transport of pregnant women [4], as well as limited synthesis and insight [3,4].

The aim of the present systematic review was to examine qualitative literature on maternal emergency transport to explore people’s experiences of using transport, the options available, and the barriers and facilitators encountered. There was a focus on qualitative studies to elicit insights on how transport systems work and what might be done to improve the acceptability and availability of different transport modalities, in order to enhance policy and program interventions relating to transport.

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## 2. Materials and methods

### 2.1. Data sources and searches

Databases were systematically searched for qualitative studies on emergency transport in LMICs (Supplementary Material S1). MEDLINE, EMBASE, BNI, Cochrane Library, CINAHL, African Index Medicus, ASSIA, QUALIDATA, Reproductive Health Library, and Science Citation Index (inception to April 2012) were searched without language restriction. Hand searching complemented electronic searches. The search terms were “ambulance,” “motorbike ambulance,” “bicycle ambulance,” “emergency referral,” “emergency access,” “emergency transport,” and “ambulance emergency.” These terms were selected iteratively through scoping searches. Qualitative filters refined the search (“focus group,” “qualitative,” “observational methods,” “interview,” and “narrative”). Studies were included if they contained qualitative data alone or both qualitative and quantitative data.

### 2.2. Study selection and data extraction

Studies presenting primary data and involving qualitative data collection methods (interviews, focus groups) were included if they reported the processes and experiences of emergency transportation to a place of emergency care in LMICs. Studies that had no information on emergency transport, no qualitative data, or no primary data were excluded. Studies from countries not classified by the World Bank as low- or middle-income were excluded [5]. Titles and abstracts were

scrutinized by 2 authors (A.W. and S.H.) and full manuscripts of studies meeting the inclusion criteria were acquired; disagreements were resolved by discussion with a third author (A.C.). Studies that did not address maternal transport exclusively but had relevant qualitative information were included.

#### 2.2.1. Comprehensiveness of reporting

Independent assessment of the reporting criteria was performed by 2 authors (A.W. and S.H.) using the consolidated criteria for reporting qualitative research framework. This framework assesses the trustworthiness and transparency of studies within their settings by focusing on the research team, reflexivity, study design, analysis, and reporting [6] (Table 1).

#### 2.2.2. Synthesis of findings

Information was extracted on study characteristics, quality, and outcome data (Tables 1, 2). Thematic synthesis was used for analysis through examination and translation of common elements across the studies that explored transport for emergency obstetric care. Quotations from respondents and relevant texts were analyzed by 2 authors (A.W. and S.H.). Both authors read and re-read texts. The data were then labeled to develop a code. Initial codes closely reflected the quotations from the manuscript. Codes were continuously refined as more quotations were added. Codes then led to the development of themes and, subsequently, a thematic framework. The thematic framework was developed in Excel (Microsoft Redmond, WA, USA) and agreed between 2 authors (A.W. and S.H.). Having applied the thematic framework to

**Table 1**  
Quality assessment of included studies using the COREQ framework.

Reporting criteria	No. (%)	Studies reporting each criterion
Characteristics of research team		
Interviewer or facilitator identified	11/29 (37.9)	[2,7,10,17,21,27,28,30–32,35]
Credentials	7/29 (24.1)	[7,10,21,27,28,31,32]
Occupation	10/29 (34.5)	[2,7,9,10,18,19,21,26,28,32]
Sex	8/29 (27.6)	[2,3,8,15,18,27,30,31]
Experience and training	11/29 (37.9)	[2,7,10,13,15,21,26,27,30,31,35]
Relationship with participants		
Relationship established	6/29 (20.7)	[2,7,10,26,27,34]
Participant knowledge of the interviewer	3/29 (10.3)	[2,9,18]
Interviewer characteristics	6/29 (20.7)	[7,8,10,18,20,26]
Theoretical framework		
Methodological orientation and theory	7/29 (24.1)	[4,7,11,20–22,30]
Participant selection		
Sampling	24/29 (82.8)	[2,3,7–13,15,17–20,22,26,27,30–35]
Method of approach	12/29 (41.4)	[2,7,9,10,12,13,19–21,26,32,35]
Sample size	17/29 (58.6)	[2,4,7–10,12,13,15,18–20,22,26–28,30–35]
Non-participation	6/29 (20.7)	[9,13,18,20,31,35]
Setting		
Setting of data collection	16/29 (55.2)	[2–4,7,9–13,18,19,24,28,30,31,35]
Presence of non-participants	4/29 (13.8)	[7,22,26]
Description of sample	18/29 (62.1)	[2,7–9,12,13,15,17–22,26–28,31,35]
Data collection		
Interview guide	13/29 (44.8)	[2,3,7,9,12,17,20,22,27,28,31,34,35]
Repeat interviews	0/29 (0.0)	–
Audio/visual recording	10/29 (34.5)	[2,7–11,13,18,26,28]
Field notes	4/29 (13.8)	[9,10,28,34]
Duration	7/29 (24.1)	[2,8–10,21,26,28]
Data saturation	1/29 (3.4)	[10]
Transcripts returned	0/29 (0.0)	–
Data analysis		
Number of data coders	1/29 (3.4)	[4]
Description of the coding tree	1/29 (3.4)	[9]
Derivation of themes	19/29 (65.5)	[4,7–13,15,18,19,21,26,27,30,31,33–35]
Software	15/29 (51.7)	[2,4,7–9,12,13,15,17–20,31,33]
Participant checking	4/29 (13.8)	[4,15,20,34]
Reporting		
Quotations presented	19/29 (65.5)	[2,4,7–13,15,17,18,21,22,27,30,31,33]
Data and findings consistent	29/29 (100.0)	[2–4,7–16,18–22,26–28,30–35]
Clarity of major themes	25/29 (86.2)	[2–4,7–13,15,17–21,26–28,30,31,33–35]
Clarity of minor themes	12/29 (41.4)	[2–4,7,8,10,18,19,26,27,30,31]

Abbreviation: COREQ, consolidated criteria for reporting qualitative research.

**Table 2**  
Characteristics of included studies.

Study (setting)	Perspective	Participants	Focus of paper	Themes	Data collection (response)	Method (analysis) <sup>a</sup>
BEN [12] (Namibia)	Transport users, healthcare providers, transport providers, local authorities	118 transport users, 43 health providers, 23 transport providers, 16 local authority members	Relationship between access to health and access to transport	TOSACFE	FGD, interview (NR)	MM (NR)
Benegusenga [4] (Rwanda)	Stake holders in health and transport sectors, people at health centers	97 in focus groups	Ingobyi transportation	TOGEF	FGD, interview (NR)	PA (NR)
Berhanu [3] (Ethiopia)	Medical personnel, patients, transport operators/users	NR	Safe transport for high-risk patients	TOSGFE	Questionnaire, interview (NR)	MM (NR)
Brentlinger [20] (Mexico)	Health workers, heads of households, village and council members, community leaders	1227 women	Use of pregnancy-related service	TGCF	Survey, interview (20 houses not interviewed)	MM (NR)
Cham [11] (Gambia)	Family members, persons present at death	NR	Sociocultural and health service factors associated with maternal death	TOSGFEA	Interview (10 cases NR)	VA (GT)
D'Ambruoso [7] (Burkina Faso, Indonesia)	Relatives of dead women	174 relatives	Causes of maternal death and sociocultural factors	TOACFE	Interview (NR)	VA (TA)
D'Ambruoso [10] (Indonesia)	Final caregivers	Families of 104 deceased women	Access to healthcare in obstetric emergencies	TGFE	Interview (NR)	VA (TA)
Hasan [22] (Bangladesh)	Community members, transport operators, doctors, nurses	300 households, 104 participants	Relationship between mobility and access to health in remote areas	TOGFE	FGD, PA (NR)	NR (NR)
Kawuwa [28] (Nigeria)	Community, government, or female leaders; teachers; transport unions	30 interviewees	Maternal mortality factors and barriers to treatment of obstetric issues	SFG	Interview (NR)	NR (NR)
Lori [21] (Liberia)	Women with severe morbidity/near-miss, family/carers of dead	148 cases	Circumstances surrounding maternal mortality and severe morbidity	TOF	Interview (NR)	Descriptive (DA)
Lungu [33] (Malawi)	Elders, chiefs, childbearing women/partners	10 villages, 30 focus groups, 92 interviews	Bicycle ambulances for referral of pregnant women	ACF	FGD, interview (NR)	MM (iterative)
Maganya [30] (Kenya)	Stakeholders in transport and health sectors	389 respondents	Linkages between mobility and health	TOSGFE	FGD (NR)	Exploratory (PHA)
Mashiri [27] (South Africa)	Homecare practitioners, leaders, community members, health officials	36 interviews, 3 focus groups	Influence of mobility and access on rural healthcare	TOSGCFE	Interview, questionnaire, FGD (NR)	MM (NR)
Mlay [9] (Tanzania)	Women with obstetric emergencies or of reproductive age, men	250 interviews, 24 focus groups	Emergency transport needs of rural pregnant women	TOSGACFE	FGD, interview, questionnaire (7/10 attended)	MM (TA)
Muleta [17] (Ethiopia)	Health professionals, road authority officials	170 participants	Factors associated with healthcare facility access, development of obstetric fistula	TOSGAFE	FGD, interview (NR)	Case control (LR)
Nyamandi [2] (Zimbabwe)	Childbearing women, village heads or health workers, parents, leaders, Uhuru riders	120 interviews, 10 focus groups	Impact of community ambulance on community	TOSGCFE	FGD, interview, CS (NR)	MM (NR)

Oyesola [24] (Nigeria)	Community members, nurses, doctors, management personnel	NR	Attitudes to, perceptions of, and practices at healthcare institutions	OSGA	FGD, interview (NR)	NR (NR)
Peterson [13] (Uganda)	Neighborhood caretakers	18 focus groups	Referral of severely ill children to hospital	TOAF	FGD (77% were followed-up after 2 weeks)	MM (DA)
Prevention of Maternal Mortality Network [26] (Nigeria, Ghana, Sierra Leone)	Health providers	184 focus groups	Barriers of healthcare facilities when obstetric problems arise	TOSGACFE	FGD (NR)	FGD (TA)
Price [34] (Nepal)	Childbearing women	NR	Women's perceptions of barriers to emergency obstetric care services, quality of care	TOGSC	Interview (NR)	Key informant (AF)
Razzak [35] (Pakistan)	Administrators of ambulance service and inpatients	92 patients, 7 ambulance administrators	Pre-hospital system, mode of transport used, barriers to ambulance use	TOGAF	Interview (1 refused)	Interview (Epi Info)
Samai [16] (Sierra Leone)	Community members	NR	Mode of referrals and transportation	TGF	FGD (NR)	Preparatory (NR)
Schmid [32] (Tanzania)	Community members, leaders, healthcare providers/workers, traditional healers	110 interviews	Emergency transportation plans for urgent obstetric care	GA	Interview (NR)	MM (NR)
Shehu [14] (Nigeria)	Community members, healthcare workers	NR	Transportation problems, causes of poor use of health services	TOSAFG	FGD, CS (NR)	MM (NR)
Strestha [15] (Nepal)	Mothers, fathers, grandmothers, health workers, district officials, transport organizations	93 mothers, 121 health service users	Transport barriers to health service access for women/poor people	TOSGCF A	FGD, interview, CS (NR)	MM (DA)
Terra de Souza [31] (Brazil)	Mothers/female relatives of dead infants	127 households	Factors contributing to neonatal death	OSF	Interview (NR)	VA (TA)
Turan [18] (Eritrea)	Fistula patients, family members	11 new patients, 5 family members, 15 follow-up patients	Community mobilization and safe motherhood education	TOSAG	Interview (26/102)	Ethnographic (DA)
Urassa [19] (Tanzania)	Relatives of dead women, healthcare staff	Family members of 117 maternal deaths	Operational factors in maternal death	TOF	Interview (NR)	VA (NR)
Whitby [8] (Indonesia)	Staff, widows, transport users, women, health assistants, women's representatives, fathers, couples	18 focus groups (15 participants each), 112 interviews, 18 villages each (approximately 20 participants)	Mobility in maternal health	TOGACFE	FGD, interview, CS, PA (NR)	MM (NR)

Abbreviations: A, autonomy; AF, analytical framework; C, culture; CS, case study; DA, descriptive analysis; E, ergonomics; F, finance; FGD, focus group discussion; G, geography; GT, grounded theory; LR, logistic regression; MM, mixed methods; NR, not reported; O, transport options; PA, participatory approach; PHA, phenomenological analysis; S, local support; T, time for transport; TA, thematic analysis; VA, verbal autopsy.

<sup>a</sup> As reported by the authors.

individual manuscripts, in order to build-up a picture of the data as a whole and to consider the range of each theme, the data were charted. Charts were developed using themes against individual manuscripts.

This method sought to develop an analytical framework, ensuring that the themes built-up were cross-checked with other data within and between studies so that the validity of emerging explanations was tested and improved (Fig. 1).

### 3. Results

The literature search and study selection process is shown in Fig. 2. Twenty-nine qualitative studies providing information on transport for emergency healthcare in LMICs were included. Study characteristics are shown in Table 2, including participants, setting, methodology, analytical process used, and the main themes explored.

#### 3.1. Comprehensiveness of reporting

The comprehensiveness of reporting varied across studies (Table 1). Characteristics of the research team were reported in 11 (37.9%) papers and the interviewers' relationship with the participants was reported in 6 (20.7%) articles. The theoretical framework used was reported in 7 (24.1%) papers, although the sampling of participants was better described in 24 (82.8%). Eighteen (62.1%) studies provided adequate sample descriptions. The research setting was described in 16 (55.2%) articles and the details of the interview guide were given in 13 (44.8%). Derivation of the themes was reported in 19 (65.5%) papers. All studies showed consistency in data findings and reporting, and 25 (86.2%) demonstrated clarity in reporting and presenting the major themes.

#### 3.2. Synthesis

Many transport forms were used to access emergency obstetric care in LMICs. Non-motorized transport included carrying, animals, bicycles, and walking. Motorized transport included cars, taxis, motorcycles, public and commercial transport, and ambulances. Various forms of water transport were used.

Eight major themes were identified: time for transport; transport options; geography; local support; autonomy; culture; finance; and ergonomics (Fig. 3). Quotations from the studies illustrating these themes are provided in Supplementary Material S2.

#### 3.3. Time for transport

This theme involves the time spent waiting for transport and the time spent traveling (speed and distance covered). Eight studies reported travel and waiting time [2,7–13].

##### 3.3.1. Travel time

Various travel times and speeds were reported, ranging from 10 minutes to 1 day for reaching a health facility (Box 1). Twelve studies reported the journey to be between 2 and 6 hours [7–9,14–22], and 6 studies reported the time traveled to be in excess of 6 hours [8,9,14–17]. Long transport time was reported to be associated with mortality in 3 studies [15,19,20] (Box 1), and timely transfer in 1 study facilitated a favorable maternal outcome [2]. The majority emphasized the link between a lengthy journey and maternal death. One study reported a 9% increase in mortality for every 30 minutes of vehicular travel [23].

##### 3.3.2. Waiting times

Participants in 7 studies commented on the amount of time they had spent searching for transport or waiting for transport to arrive [2,8,9,11–14]; a wait of up to 2 days was reported in 2 studies [9,14].

Maternal and neonatal deaths were reported while waiting to travel by public transport (Box 1).

#### 3.4. Transport options

Nine studies reported difficulties in finding transport [2,7–10,15,17,18,24], and participants from 2 studies described a complete lack of transportation [7,11] (Box 1). Availability or lack of transport options appeared to vary according to geographical location, especially within remote areas and in economic situations involving uneven distribution of public sector spending [25]. Full vehicle occupancy prevented patient transport in 4 studies [9,11,26,27] (Box 1).

#### 3.5. Geography

This theme describes the terrain and meteorological aspects related to transport of obstetric patients. Five studies reported that weather conditions or state of roads affected emergency transport [8–10,18,27] (Box 1).

##### 3.5.1. Terrain

Two studies reported poor road conditions due to mountainous, flooded, or eroded terrain [8,9], although this was not in reference to a specific transport mode.

Terrain can directly affect ability to reach emergency care [28]. However, some forms (motorcycle ambulances such as the "Uhuru" [2] and "eRanger" [29]) were effective because they were particularly compatible with the local terrain (Box 1).

##### 3.5.2. Meteorological

Heavy rains were cited in 4 studies as affecting emergency transport [8–10,27] (Box 1). These studies showed that inaccessible roads during the wet season can cause delays to journeys and unreliable operation of public transport services (Box 1). Two studies suggested that the efficiency of different methods of transport varied with seasonal changes [8,15]. These studies showed that public transport was more reliable in the dry season, although high temperatures could negatively impact the journey experience.

#### 3.6. Local support

This theme includes the different sources of support and lack of support for pregnant women accessing emergency transport. Participants from 8 studies [2,7–10,27,30,31] commented on the amount or lack of support received from the following sources.

##### 3.6.1. Family

Three studies reported that husband's support was necessary for accessing emergency transport [13,14,17]. However, 2 studies showed that arrangements for childbirth, including emergency care and transport, were the responsibility of women [9,32]. One study reported that women had received support from their husbands [9]. Lack of support and women feeling alone when requiring emergency transport were highlighted in 3 studies [7,9,10] (Box 2).

##### 3.6.2. Community

Four studies described community support or involvement in emergency transport; this varied from carrying a patient on a stretcher to providing bicycles or financial contributions [8,9,27,30] (Box 2).

##### 3.6.3. Dependents

In 2 studies, women voiced the constraints faced when seeking emergency transport while also looking after children [9,31] (Box 2).

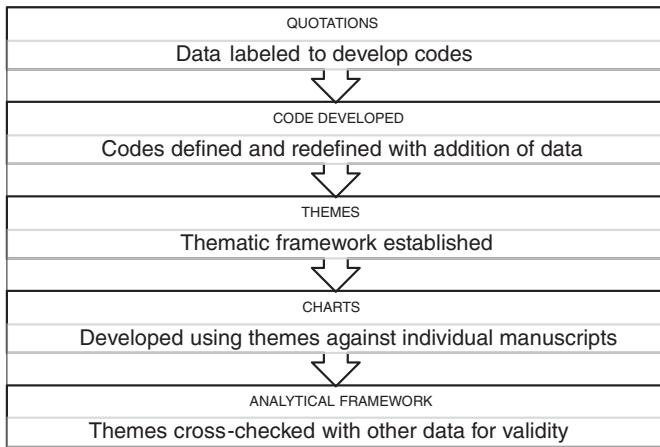


Fig. 1. Data analysis.

3.6.4. Refusal

Owners or drivers of vehicles may refuse to provide emergency transport owing to concerns about soilage in the case of hemorrhage [14] or the legal implications if a woman dies in transit [26].

3.7. Autonomy

This theme includes personal, financial, educational, and family autonomy and it can be facilitated or removed by family, community, and other decision makers. A distinction can be made between support and autonomy: a woman’s partner can be supportive without

affording her autonomy. The financial dependence of women on their husbands and families compromises their autonomy in accessing and using emergency care [9]. Two studies expanded on this, finding that women were economically dependent on men and had restricted or no independent finances to access transport, unless designated by their husbands [8,26] (Box 2).

Three studies suggested that women relied on others for decision making with regard to emergency transport [9,17,26]. Research found that women forgo emergency transport owing to domestic constraints [27].

3.8. Culture

Various sociocultural aspects associated with emergency transport were evident. Six studies discussed sociocultural beliefs or practices affecting emergency transport of pregnant women [7–9,11,26,33]. One study discussed how emergency transport was not kept available because it was considered to bring bad luck [34], whereas another study reported how pregnant women were deterred from using the bicycle ambulance because they believed that publicizing labor could summon evil spirits [33] (Box 2).

3.8.1. Embarrassment

One study showed that users of emergency transport found the experience shameful, especially when they were bleeding heavily [9]. This might be particularly distressing for women if menstruation is associated with pollution taboos [34] (Box 2). Social exclusion and caste difference within cultural groups were cited as barriers to transport services. However, 1 study found that all social classes within a specific region could use the Uhuru without discrimination [2].

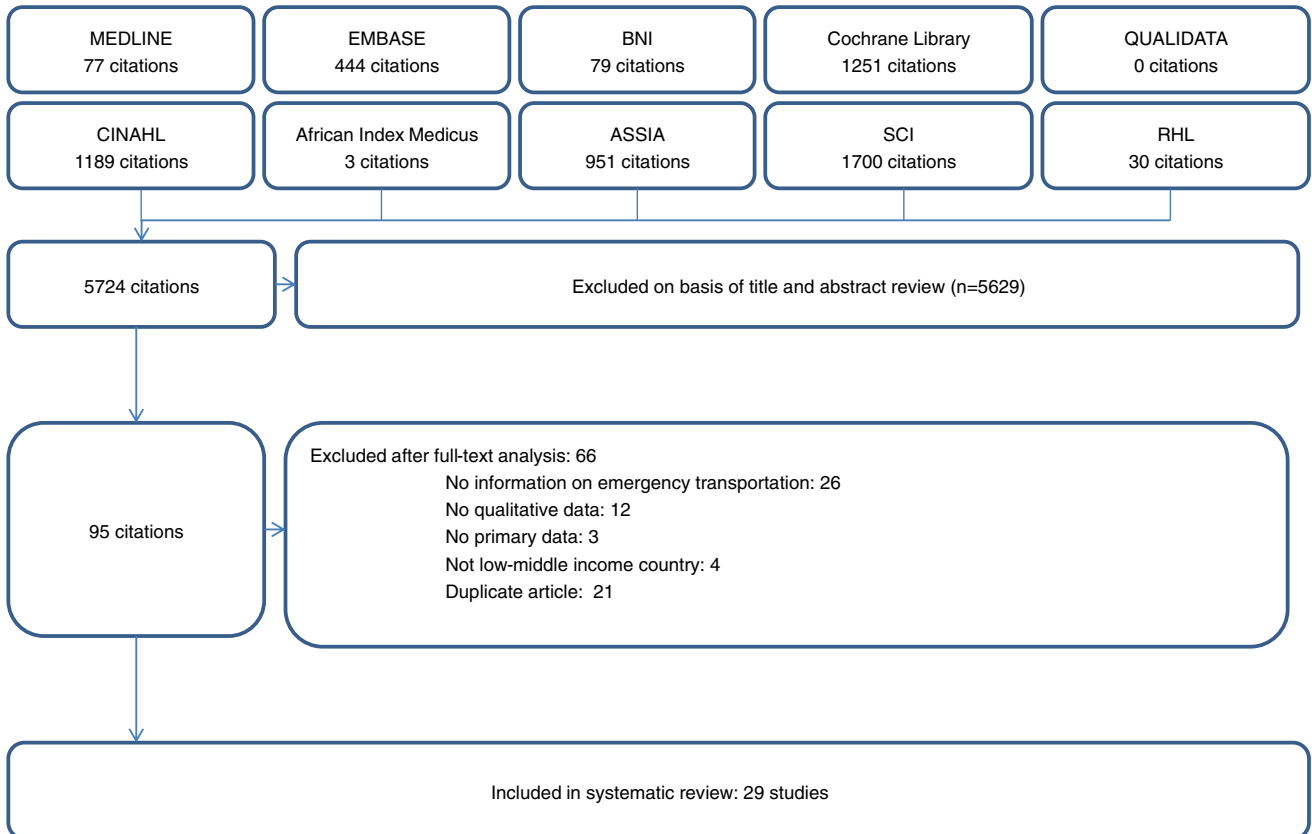


Fig. 2. Results of search strategy and identification of included publications.

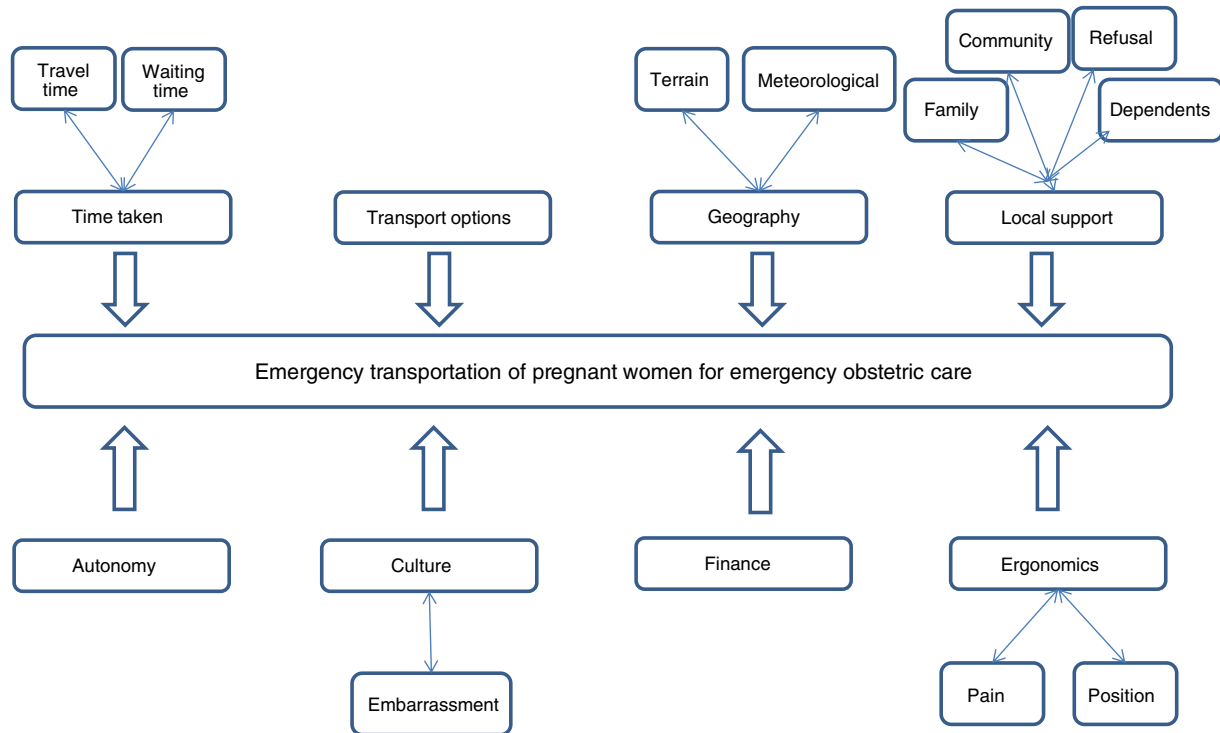


Fig. 3. Themes and subthemes identified in maternal emergency transport.

### 3.9. Finance

This theme involves the capacity or inability to pay for emergency transport because of poverty or excessive fees. Two studies highlighted that users felt financially exploited when in need of emergency transport [15,17]. The high cost of emergency transport was reported by respondents in 5 studies [7–9,27,35]; the cost escalated during the

#### Box 1

Quotations regarding themes of time for transport, transport options, and geography.

##### Time for transport

“People must walk an hour and a half to get to the asphalt road” [8].  
 “We took her to the health centre in the village...She was examined by a nurse who later transferred her to another health centre (44 km away). There she spent the night, the following morning she was transferred to the hospital (36 km away), on our way we had to cross the river at two different crossing points. Immediately after we reached the hospital she died” [11].  
 “Patients get exhausted and even die whilst waiting for an ambulance” [12].

##### Transport options

“We looked for transport in the village throughout the night but could not get one” [11].  
 “We took her to the main road to look for transport. We were there up to 12 midnight but couldn’t get transport. All vehicles that came were full” [11].

##### Geography

“A lot of roads have holes” [8].  
 “Uhuru is the answer to rural transport irrespective of terrain” [2].  
 “I was very uncomfortable travelling for 7 hours on a full bus, the roads were very slippery because of the heavy rains which made it worse” [9].

evenings and the rainy season, and where vehicle availability was limited and military road blocks were present [20] (Box 2).

Motorcycle ambulance was found to be affordable in 1 study, in which all respondents felt that they could afford the Uhuru despite only 20% being in formal employment [2] (Box 2).

Emergency transport costs are often higher than most people can afford [30]. Only 12% of participants in 1 study reported that there was an affordable vehicle [2].

### 3.10. Ergonomics

This theme encompasses transport ergonomics, the journey experience, and comfort. Four studies commented on aspects relating to ergonomics [7–9,17].

#### 3.10.1. Pain

Three studies reported that users experienced pain when using emergency transport, particularly bicycles [9,17,26] (Box 2). In 1 study, 80% of respondents reported experiencing a painful journey; however, the type of vehicle was not reported [26].

#### 3.10.2. Position

The acknowledged optimal position for transfer of an obstetric patient is horizontal, with a left lateral tilt. Transport users were reported as feeling incapable of adopting the position required for emergency transport on a motorcycle [10]. In 1 study, more than half of respondents experiencing fetal demise believed that their position during transit may have been responsible [4].

## 4. Discussion

Eight themes emerged from the present meta-synthesis. The data showed the breadth and depth of the issue, and the many interlinked physical, psychological, financial, and cultural facets. It is apparent that increasing transport in order to increase healthcare accessibility,

**Box 2**

Quotations regarding the themes of local support, autonomy, culture, finance, and ergonomics.

**Local support**

Transportation was difficult, and I also have four other young children" [31].

"In emergency situations, we cannot rely on hospitals and clinics...we have to depend on community members with a car or a taxi to help us" [27].

"When you are in danger you are just left alone at home with your young children. What can you do, you cannot go to seek help and leave the children alone" [9].

**Autonomy**

"They [husbands] do not give a cent for transport" [9].

**Culture**

"Here if people see you going to the hospital for a delivery, they can bewitch you" [33].

"I cannot explain how bad it was, bleeding whilst riding a bicycle" [9].

**Finance**

"The transport in our village is only lorry and very difficult for poor people to rent because it is very expensive" [8].

"My life was saved as the Uhuru served me when I had complications at my last delivery. I was transported from the clinic to the hospital just in time and at a very low price" [2].

**Ergonomics**

"One can use a bicycle to take a pregnant woman to a hospital, but you can see the pain she is going through when you go through the rough roads" [9].

and thus reduce maternal mortality, may not succeed unless attention is paid to key proximal and distal factors (Fig. 4).

There is a scarcity of well-designed and well-conducted research on emergency obstetric transport in LMICs, and little conclusive evidence regarding effectiveness. A literature review examining auxiliary technologies for transport and communication for obstetric emergencies reported that the most significant issue was the short time interval available for action, which limited options for obstetric referrals [36]. It concluded through "cumulative experience" that motorized transport is likely to be the most acceptable and effective option [36]. Comprehensive reports have focused on the delay in reaching care, rather than focusing on transport alone [37]. Such reports explore the conceptual understanding of the "second delay" and review infrastructure, finances, and communications in emergency obstetric care, as well as suggesting steps to address this delay. These reports provide limited information on the views and perspectives of transport users.

The present meta-synthesis will enrich current knowledge regarding emergency transport of pregnant women. The intention was to provide an overview of emergency transport and a fuller insight into the barriers and facilitators associated with emergency transport, drawing on the perspectives of transport users themselves. The review was not intended to be generalizable to every LMIC; instead, individual themes, facilitators, and barriers can be appreciated within local contexts.

**4.1. Overcoming barriers and suggested facilitators**

Several means of emergency transportation were identified, although the results highlight the fact that suitability can vary between geographical locations and across seasons and cultures. Within this context, the optimal means of emergency transport would need to be capable of traveling at reasonable speed, with immediate arrival to the patient to ensure timely transfer.

**4.2. Reducing time for transport**

More than 60% of people in low-income countries live more than 8 km from their nearest healthcare facility, and maternal mortality is estimated to increase by 2% with every 10% increase in distance traveled to reach a place of care [38]. There is, therefore, a need for an efficient and effective emergency transport service to ensure that women receive timely lifesaving care. One study provided guidelines for emergency transport to prioritize vehicle use, although details were not provided in the manuscript [39]. Another study reduced transport time by placing motorcycle ambulances in the community [2]. The placement of vehicles—whether at the hospital, health center, or village level—may have an important role in reducing time for transport, although this did not emerge as a theme in the present review.

**4.3. Improving transport options**

Transport options can be improved if a suitable, reliable, and affordable service is available. A program that has facilitated the transport of laboring women in Pakistan involves a partnership with the local taxi service; the taxi drivers provide an emergency service for a fixed fee, which is reimbursed from charitable sources [40].

**4.4. Overcoming geographical barriers**

Studies have recommended ways of overcoming geographical barriers by road [4]. Exploration of local topographical challenges before investment in a specific transport type, and collaborating with local services suited to local terrain (e.g. minibus taxi services) can facilitate effective transport [40].

**4.5. Improving local support**

Community awareness programs have been shown to increase support and assistance for pregnant women requiring emergency transport [14]. For example, drivers of commercial vehicles were reluctant to transport pregnant women or they charged exorbitant fees. Following community mobilization schemes, transport users gave a positive response and transport providers were more amenable in providing transportation [14]. Community education may address the cultural beliefs resulting in a lack of support [11].

**4.6. Enhancing autonomy**

Women's participatory action groups have a key role in empowerment of women and the wider community. The restricted independence some women face may pose an obstacle for emergency transport. This may apply to a lack of financial independence or dependence on other family members for decision making [14]. Raising community awareness in support of safe motherhood may contribute to the success of transportation projects [29,32]. It is suggested that transport schemes are effective if they are owned by the local

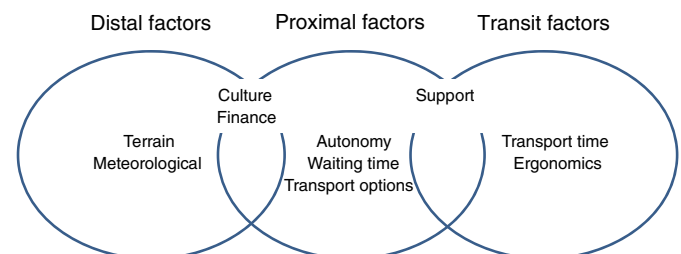


Fig. 4. Factors associated with maternal emergency transport.



community, although communication, advocacy, and leadership are necessary to facilitate autonomy in emergency transport.

#### 4.7. Addressing culture

Social exclusion and difference in caste within communities were cited as barriers to emergency transport; however, 1 study found that all social classes within a region were able to use the Uhuru without discrimination [2]. Shehu et al. [14] recommended that taboos could be challenged by educating transport operators, and community education could influence cultural beliefs.

#### 4.8. Addressing finances

Money is not an absolute barrier, as relatives are sometimes able to collate necessary funds [26]. Four studies supported this finding, with people selling livestock or organizing loans to fund transport [7,12,13,17]. Access to emergency transport was facilitated by subsidies from the local community (e.g. financial or resource) [9] or insurance schemes (e.g. poverty certificates) and charities. Transport schemes organized and run by the local community—such as the Ingobyi (stretcher) scheme—can reduce financial barriers and facilitate emergency transport; such schemes require affordable financial contributions from members of the community. Contributions ensure the maintenance and correct management of its use, so it is freely available in emergency situations [4]. Such schemes can benefit any member requiring emergency healthcare access, not solely pregnant women.

#### 4.9. Addressing ergonomics

Achieving a safe and comfortable position is a key barrier in emergency obstetric transportation. Respondents from 1 study described the Uhuru as a safe and effective form of emergency transport, as the trailer could be adapted to suit the passenger's position [2].

### 5. Conclusion

To achieve an effective, reliable, and affordable means of transport, a number of key recommendations can be made. Clear guidance should be given to prioritize the use of vehicles for emergency transport. There should be consistent availability of affordable and suitable transport for pregnant women, to enable transportation in the optimal position. The vehicle should be compatible with terrain and customs to minimize obstructions to use by community and peers, and drivers should be educated in the importance of emergency obstetric transport.

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#### Conflict of interest

The authors have no conflicts of interest.

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