Research Article

Perinatal Mortality Rate in Pakistan and other South-Asian Countries

Isha Tahir[1], Iqra Ahsan[2], Isha Nadeem[3], Khawar Ali[4], Maaz bin Amir[5], Ramsha Mushtaq Khan[6], Tabinda Dugal[7], Saira Afzal[8]

[7] *Consultant Royal Cornwall Hospital NHS Trust UK*
[1-6] *King Edward Medical University/ Mayo Hospital, Lahore* [8] *King Edward Medical University/ Mayo Hospital Lahore*

ABSTRACT:

Background: Pakistan reportedly has made little progress in reducing its high burden of perinatal deaths, putting the achievement of the SDG target of ending preventable newborn mortality by 2030 at risk. This systematic review aimed to assess Pakistan's perinatal mortality rate (PMR) compared to other South Asian countries.

Objective: To assess the burden of perinatal mortality from 2010-2020 and compare the perinatal mortality rates in Pakistan and other South Asian countries.

Methodology: We systematically searched three databases for studies from 2018-2023 reporting stillbirth rate (SBR), early neonatal mortality rate (ENMR), and/or perinatal mortality rate (PMR) in South Asian countries. Sixteen studies met the requirements and provided rates for the four countries—Pakistan, India, Bangladesh, and Nepal—which were then contrasted and graphically depicted.

Results: Across all studies, Pakistan had the poorest perinatal mortality outcomes in South Asia. The PMR in Pakistan varied between 58 and 91 per 1000 births, which is much higher than the rates in neighboring countries (India 14-46, Bangladesh 41, Nepal 16 per 1000 births). The SBR (21-57 per 1000 births) and ENMR (31-39 per 1000 live births) were also substantially higher in Pakistan compared to India, Bangladesh, and Nepal.

Conclusions: Pakistan's disproportionately high PMR and newborn mortality signifies an urgent public health crisis. Immediate action is needed to implement known strategies that work to reduce perinatal deaths in other South Asian countries. With concerted efforts, Pakistan can accelerate progress towards the SDG target of ending preventable newborn mortality, but this requires strategic policies and investments prioritizing maternal and child health. The future of Pakistan's next generation hangs in the balance.

Corresponding Author: Dr. Ramsha Mushtaq Khan | **Email**: *ramsha.mushtaq.khan@kemu.edu.pk*

Supervisor: Prof. Dr. Saira Afzal | KEMU/ Mayo Hospital, Lahore. | **Email**: *sairamust@gmail.com*

Key Words: Perinatal mortality, Stillbirth rate, Early-neonatal mortality rate, South Asia

INTRODUCTION:

Perinatal deaths comprise stillbirths (pregnancy loss that occurs at 28 or more weeks of gestation) and early neonatal deaths (deaths among live births during the first 7 days of life). The perinatal mortality rate is calculated as the number of perinatal deaths per 1,000 total births (i.e., stillbirths and live births)[1].

The world has made substantial progress in the field of health, which has led to an increase in the survival of infants and children. However, marked disparities in neonatal and perinatal mortality exist across regions and countries. In low-income nations, the under-five mortality rate in 2021 was 67/1,000 live births, compared to just 5/1,000 live births in high-income nations. Neonatal mortality accounts for 40-60% of infant deaths in developing nations. While more than 50% of all childhood deaths are caused by neonatal mortality[2]. Sub-Saharan Africa and Southern Asia saw the highest rates of death among children and youth in 2021. About 5 million kids perished before turning 5 in 2021, with 2.7 million of those deaths occurring in the neonatal phase of these children[3]. Out of globally reported neonatal deaths in 2016, 78% occurred in Southern Asia (39%) and sub-Saharan Africa (38%)[4].

The neonatal and perinatal mortality rates are the health indicators that reflect the quality of health services in a country[5]. Pakistan has one of the greatest burdens of perinatal deaths globally, yet has made little progress in reducing these losses. According to the Pakistan Demographic and Health Survey (PDHS) 2012-13, despite the gradual progress in improving childhood health parameters such as Under-Five mortality and Infant mortality, there is no development in the reduc-tion of neonatal mortality. Instead, Pakistan has shown a rise in neonatal mortality rate since 1990[6]. According to the previously mentioned survey, neonatal deaths accounted for over 75% of infant deaths. Pakistan continues to report high neonatal and infant mortality rates of 42 and 62 per 1000 respectively in the years 2012-16 as stated by PDHS 2017-18 survey. The NMR remained stagnant at 42/1000 live births from 2012-2019, but infant mortality showed a modest drop following the year 2016. Pakistan reported the PMR of 57/1000 births from 2012-2016 (SBR 23.4 and ENMR 34)[7,8.]

The PMR and SBR in South Asia are among the highest in the world. The predicted number of stillbirths at 28 weeks or more in 2019 was 2.0 million globally, with a stillbirth rate of 13.9 per 1,000 live births worldwide. In South Asia, the total number of stillbirths was 0.9 and 0.7 million in 2010 and 2019 respectively, with an annual rate of reduction (ARR) of 3%. The average SBR of Southern Asia is 17.7/1000 in 2019[9]. Among the South Asian countries, India made the largest reduction of 53% in stillbirths from 2000 to 2019 and showed an ARR of 4.8%. In contrast, Pakistan reported an ARR of only 1.4% during the same period and its SBR stands at almost double the global average of 13.9/ -1000 as of 2019[9]. This demonstrates that Pakistan has shown no improvement in reducing neonatal mortality and perinatal mortality, indicating a lack of progress in quality maternal and newborn care. Consequently, Pakistan is at risk of failing to meet the ENAP 2030 goals of reducing SBR and NMR each to 12/1000 or lower due to this lack of advancement[3].

This systematic review aimed to assess the perinatal mortality rate (PMR) in Pakistan compared to other

South Asian countries from 2010-2020. Understanding Pakistan's high PMR relative to neighboring countries can help inform urgent actions needed to address this major public health crisis and get on track to achieve the SDG target 3.2 "End preventable deaths of newborns and children under 5 years of age"[10].

MATERIALS AND METHODS:

We conducted a systematic review of studies reporting the stillbirth rate (SBR), the early neonatal mortality rate (ENMR), and/or the perinatal mortality rate (PMR) in Pakistan and other South Asian countries including India, Bangladesh, Nepal, Sri Lanka, Bhutan, Afghanistan, and Maldives.

We searched three electronic databases (Google Scholar, PubMed, and Cochrane Library) using relevant keywords, MeSH, and free text terms including "stillbirth", "early neonatal mortality", "perinatal mortality", "South Asia" and names of individual countries. The search results were imported into EndNote for deduplication. Two reviewers independently screened titles, abstracts, and full texts against pre-specified inclusion criteria. Any conflicts were resolved through discussion with a third reviewer.

The studies were included if they 1) were of observational study designs including cross-sectional surveys, cohort studies, census/ surveillance, 2) reported SBR, ENMR, and/or PMR as outcome measures, 3) were conducted in one or more South Asian countries, 4) were published from January 2018 to March 2023.

We excluded reviews, RCTs, studies focused only on risk factors, qualitative studies, and those involving specific subpopulations. Studies were also excluded if the full text was unavailable or if they were not in the English language.

The inclusion and exclusion of studies are depicted in the PRISMA flowchart. Descriptive analyses were performed to summarize study characteristics and rates. This review was reported following PRISMA guidelines. (Figure 1)

Data were extracted using an Excel spreadsheet. For included studies, two reviewers independently extracted data including author, year, country, study design, population, sample size, and rates for SBR, ENMR, and PMR into an Excel sheet. (Table 1)

A data extraction sheet was created including the following: authors and year of publication, region, study design, study setting, sample size, stillbirth rate, early neonatal mortality outcome, and perinatal mortality outcome. Different definitions of mortality were studied. Fifteen studies reported on the rates of stillbirths [11-20] [22-26], five studies reported on 7-day neonatal mortality rates(ENMR)[11] [15] [17] [18] [22], and eight studies reported on perinatal mortality rates [11] [15] [17] [18] [22-25].

The descriptive analysis was done using Microsoft Excel. Studies were grouped according to the countries (India, Pakistan, Bangladesh, and Nepal) and the perinatal outcomes studied in this systematic review (SBR, ENMR, and PMR). The mortality rates observed in different studies are shown in tabulated form. (Table 2)

RESULTS:

Through literature research, 1085 articles were identified. After removing 48 duplicates, 1037 articles were screened based on titles and abstracts, of which 990 were excluded. The full text for 4 articles was unavailable, so the remaining 43 underwent full-text screening. After applying the inclusion/exclusion criteria, 16

studies were included in the final review.

The included studies comprised 12 cohort studies, 3 cross-sectional analyses, and 1 population-based study. Sample sizes ranged from 109 to 886,505 participants. The number of studies conducted in each country are; Bangladesh (1), Nepal (1), India (4), and Pakistan (4), both Pakistan and India (5) and for India, Pakistan, and Bangladesh (1). No studies from other South Asian countries met the inclusion criteria. (Figure 2)

In Pakistan, the stillbirth rate (SBR) varied widely from 11.9 to 56.9 per 1000 births across studies conducted between 2010 and 2020. The highest SBR of 56.9 per 1000 was reported by Saleem et al. in 2018; more than triple the global average [11]. Most studies after 2016 still found high SBRs from 20-48 per 1000 births [11 13 14 24 25]. In India, SBR estimates ranged from 13.7 to 29.95 per 1000, generally lower than Pakistan's. Studies by Saleem et al. and Patel et al. had higher estimates of 25 and 24 per 1000, while more recent data found SBRs around 15-22 per 1000 [15 16 21 23-25]. In Bangladesh, studies showed the stillbirth rates ranging from 20.5 to 39 per 1000 births from 2011-2016, again lower than Pakistan's [16, 26]. Nepal had the lowest SBR at 10.91 per 1000 in 2016-2017 [18].

Pakistan's ENMR ranged from 30 to 38.76 per 1000 live births from 2010-2018[11 15 18], higher than India's and Nepal's [11 15 17]. For India, ENMR estimates were 10.6 and 17.58 per 1000 live births in studies by Cherian et al. and Aghai et al. [15 22].The Nepal study had the lowest ENMR of 5.55 per 1000 live births [18].

Pakistan's PMR was the highest among the countries - ranging from 58.2 to 91.13 per 1000 births over 2010-2020[11 15 17 24].

India showed a wide PMR range of 14.3 to 46 per 1000 from 1986-2020. Two multi-country studies found the PMR in India to be around 40 per 1000[15 21-24].Nepal had the lowest PMR at 16.27 per 1000 in 2016-2017 [18]. The studies that reported at least two of the three perinatal outcomes were included in the data for the column chart. The studies were grouped according to the country to compare the different perinatal outcomes among these four countries. (Figure 3) A forest plot has also been plotted for the rates of stillbirths as found in the included studies for four countries: Pakistan, India, Bangladesh, and Nepal. (Figure 4)
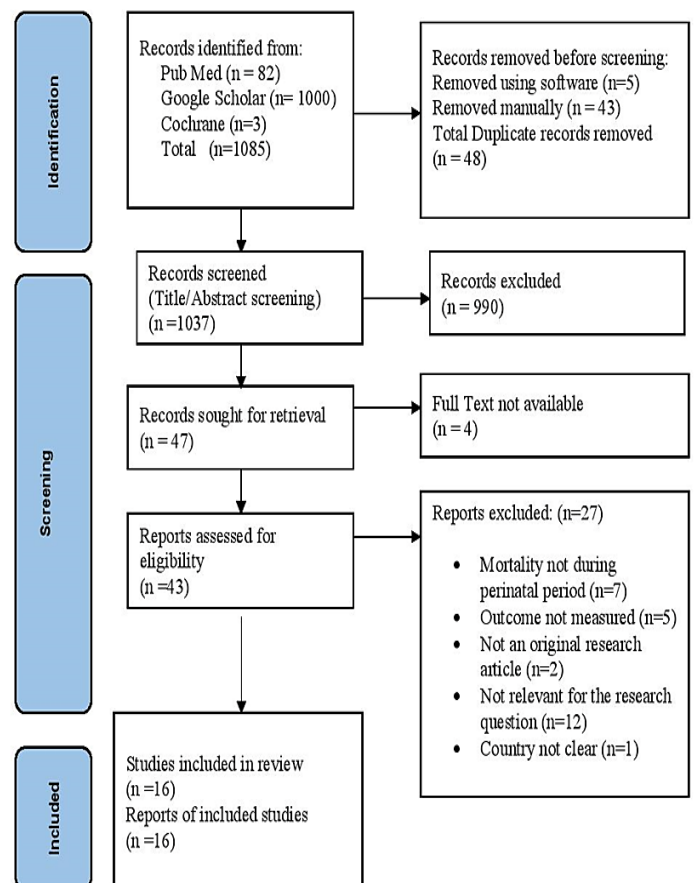

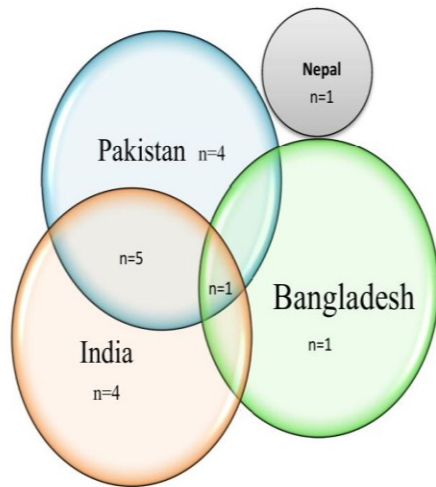**Figure 1**: The PRISMA flowchart of the search

Figure 2: Venn diagram showing number of studies included for south Asian countries
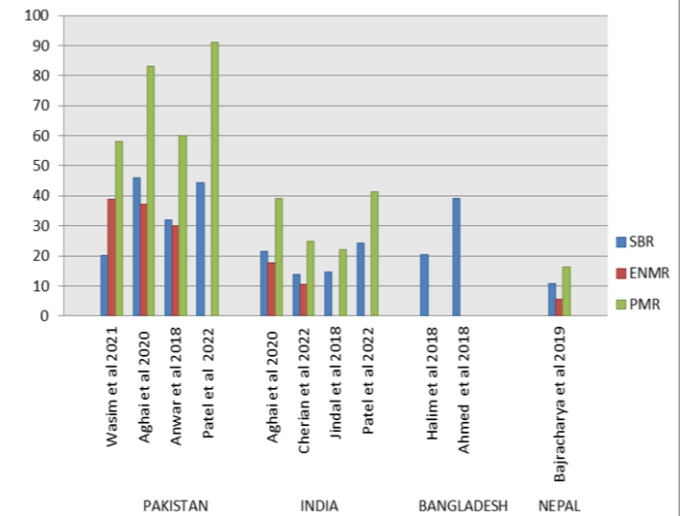

Figure 3: Perinatal mortality rates across different studies included in the systematic review.

Table 1: Characteristics of the studies included in the review

Author/ Year	Country/ Setting	Study Design	Study Period	Sample Size	Measured Outcomes	Definitions
Wasim T. et al 2021 [11]	Pakistan/ public hospital in an LMIC	Prospective cohort study	Jan 2016 - Dec 2018	11,850 births	PMR, SBR, ENMR	Stillbirth: Death at or after 28 weeks of gestation or having weight 1000g or more. ENMR: Death within 7days of birth. PMR: Stillbirths and early neonatal deaths combined per 1000 births.
Altijani N. et al 2018 [12]	Nine states in India	Secondary analysis of cross-sectional data	2010 - 2013	886,505 women,15–49 years of age with pregnancy>28 weeks whose outcome of last pregnancy is known.	SBR	SBR: No. of fetal deaths at or after 28 weeks of gestation per 1000 total births.

Author/ Year	Country/Setting	Study Design	Study Period	Sample size	Measured Outcomes	Definitions
McClure EM. et al 2018 [13]	Seven sites in six LMICs:India(Nagpur, Belagavi), Pakistan, Guatemala, DRC, Kenya and Zambia.	A prospective observational study.	2014-2015	103409 women were eligible for study	SBR	SBR: No. of fetal deaths at or after 20 weeks of gestation per 1000 total births.
Zia K. et al 2020[14]	Pakistan/Tertiary Care Hospital Lahore	Cross sectional study	Jun 1, 2016May 31, 2017	1070 Births	SBR	SBR: No. of fetal deaths at or after 28 weeks of gestation per 1000 total births.
Aghai ZH. et al 2020 [15]	Pakistan and India. The study included two Indian sites and one Pakistani site.	Secondary Analysis of collected Data	Jan 2010-Dec 2018	The data included 297 ,509 births [154,790 males (52.03%) and 142,719 females (47.97%)].	SBR, ENMR, PMR	SBR: No. of fetal deaths at or after 20 weeks of gestation per 1000 total births or fetuses weighing $\geq$ 500 grams. ENMR: No. of neonatal deaths during the first 7 days of life per 1000 live births.
Ahmed I.et al 2018 [16]	A population-based study. The study was cond-ucted in 11 sites in sub-Saharan Africa and South Asia.	Prospective cohort study	Jul 2012 -Feb 2016	278186 Pregnant Women,263563 births	SBR	SBR: No. of fetal deaths at or after 28 weeks of gestation per 1000 total births
Anwar J. et al 2018 [17]	Pakistan(Tehsil Havelian, District Abbottabad, KPK)	Population-based Prospective Study	Jun 2015 - May 2016	51690 women included, 7580 pregnancies, 7273 live births.	SBR, ENMR, PMR	SBR: No. of fetal deaths at or after 28 weeks of gestation per 1000 total births. ENMR: No. of newborn deaths within 0–6 days per 1000 live births. PMR: Still-births and early neonatal deaths comb-ined per 1000 births.
Bajracharya M. et al 2019[18]	Nepal/Tertiary Care Hospital	Cross Sectional Study	Apr 2016 - Mar 2017	1275 deliveries	SBR, ENMR ,PMR	SBR: No. of fetal deaths at or after 28 weeks of gestation per 1000 births. Peri-natal Mortality Rate is sum of stillbirths and early neonatal deaths per 1000 births. ENMR: No. of neonatal deaths in first 7 days of life per 1000 live births.
Author/ Year	Country/Setting	Study Design	Study Period	Sample size	Measured Outcomes	Definitions

Aziz A et al 2020 [19]	Pakistan, India and other LMICs	Prospective, population-ased observational study	2010 - 2018	91076 pregnancies in Pakistan and 756276 pregnancies in six other LMICs	SBR	SBR: No. of fetal deaths at or after 28 weeks of gestation per 1000 live births
Aziz S et al 2018 [20]	Pakistan(Islamabad)A hospital -based study	Longitudinal study	2012 - 2016	109 pregnant woman who are residents of Islamabad	SBR	Stillbirth: Death of a fetus before or during birth, from 28th week of pregnancy onwards, or a birth weight of 1000 gm or more.
Cherian AG. et al. 2022 [21]	India (South India, Tamil Nadu)- A population-based study	Cohort study	Jan 1986 to Dec 2018	80206 pregnancies	PMR	Perinatal mortality rate (PMR) includes both fetal deaths and death occurring during 1st week of life.
Cherian AG et al. 2022 [22]	India (South India, Tamil Nadu)	Cohort study	2008-2017	21,444 women	ENMR,PMR	Early neonatal death is defined as death during first 7 days of life. PMR includes both SBR and ENMR.
Jindal A et al. 2018[23]	India(Himachal Pradesh, Shimla) -a hospital based study	Prospective observational study	1stAug 2015-31stJul 2016	6506 births.	SBR, PMR	Stillbirth: Death of a fetus at >20 weeks of gestation, or with weight ≥500gm or more.
Patel AB et al. 2022 [24]	DRC, Guatemala, India (Belagavi, Nagpur),Kenya, Pakistan, Zambia	Secondary analysis of data collected from the Maternal and Newborn Health Registry.	Feb 2016-Feb 2020	87923 women (from six different countries including India and Pakistan)	SBR,PMR	Stillbirth: Death of fetus at >20 weeks of gestation or weight ≥500gm.
Saleem S et al. 2018 [25]	Pakistan, India and other countries	Prospective, observational study	Jan2010 - Dec 2016	427,111 births.	SBR	Stillbirth is defined as a fetal death occurring at ≥20 weeks gestation or with birth weight of ≥500 g.
Halim A. et al. 2018 [26]	Bangladesh (Jamalpur, Moulvibazar, Narail, Thakurgaon)	Population-based survey	Jan 2011 - Dec 2012	6333 stillbirths are included in this study	SBR	Stillbirth: Birth of a baby after 28 weeks of gestation with no evidence of life.

Table2. Perinatal Mortality Rates grouped for four South Asian countries

	Author/Year	Study duration	SBR[a]	ENMR[a]	PMR[a]
Pakistan	Wasim T. et al. 2021 [11]	Jan 2016 to Dec 2018	20.25	38.76[b]	58.2
	McClure EM. et al. 2018 [13]	2014-2015	43.5	-	-
	Zia K. et al. 2020 [14]	June 2016 - May 2017	48.59	-	-
	Aghai ZH. et al. 2020 [15]	Jan 2010 - Dec 2018	45.95	37.31	83.26
	Ahmed I. et al. 2018 [16]	Jul 2012-Feb 2016	40.3	-	-
	Anwar J. et al. 2018 [17]	Jun 2015 - May 2016	32	30[b]	60
	Aziz A. et al. 2020 [19]	2010 - 2018	53.5	-	-
	Aziz S. et al. 2018 [20]	2012 to 2016	11.9	-	-
	Patel AB et al. 2022 [24]	Feb 2016 -Feb 2020	44.46	-	91.13
	Saleem S. et al. 2018 [25]	Jan 2010 - Dec 2016	56.9*	-	-
India	Altijani N. et al. 2018 [12]	2010 - 2013	10.0	-	-
	McClure EM. et al. 2018 [13]	2014-2015	22.5	-	-
	Aghai ZH. et al. 2020 [15]	Jan 2010 - Dec 2018	21.58	17.58	39.16
	Ahmed I. et al. 2018 [16]	Jul 2012-Feb 2016	29.95	-	-
	Aziz A et al. 2020 [19]	2010 - 2018	24.3	-	-
	Cherian AG. et al. 2022 [21]	Jan 1986 to Dec 2018	-	-	14.3 (2016-2018)
	Cherian AG et al. 2022 [22]	2008 - 2017	13.7*	10.6*	24.86*
	Jindal A et al. 2018 [23]	Aug 2015 to Jul 2016	14.66 [b]	-	22.1
	Patel AB et al. 2022 [24]	Feb 2016 -Feb 2020	24.16	-	41.38
	Saleem S et al. 2018 [25]	Jan 2010 - Dec 2016	25.3*	-	-
Bangladesh	Halim A. et al. 2018 [26]	Jan 2011 – Dec 2012	20.5*	-	-
	Ahmed I. et al. 2018 [16]	Jul 2012-Feb 2016	39.0	-	-
Nepal	Bajracharya M.et al.2019 [18]	Apr 2016 - Mar 2017	10.91	5.55 [b]	16.27

[a] Denominator is 1000 total births unless otherwise specified

[b] Denominator is 1000 live births

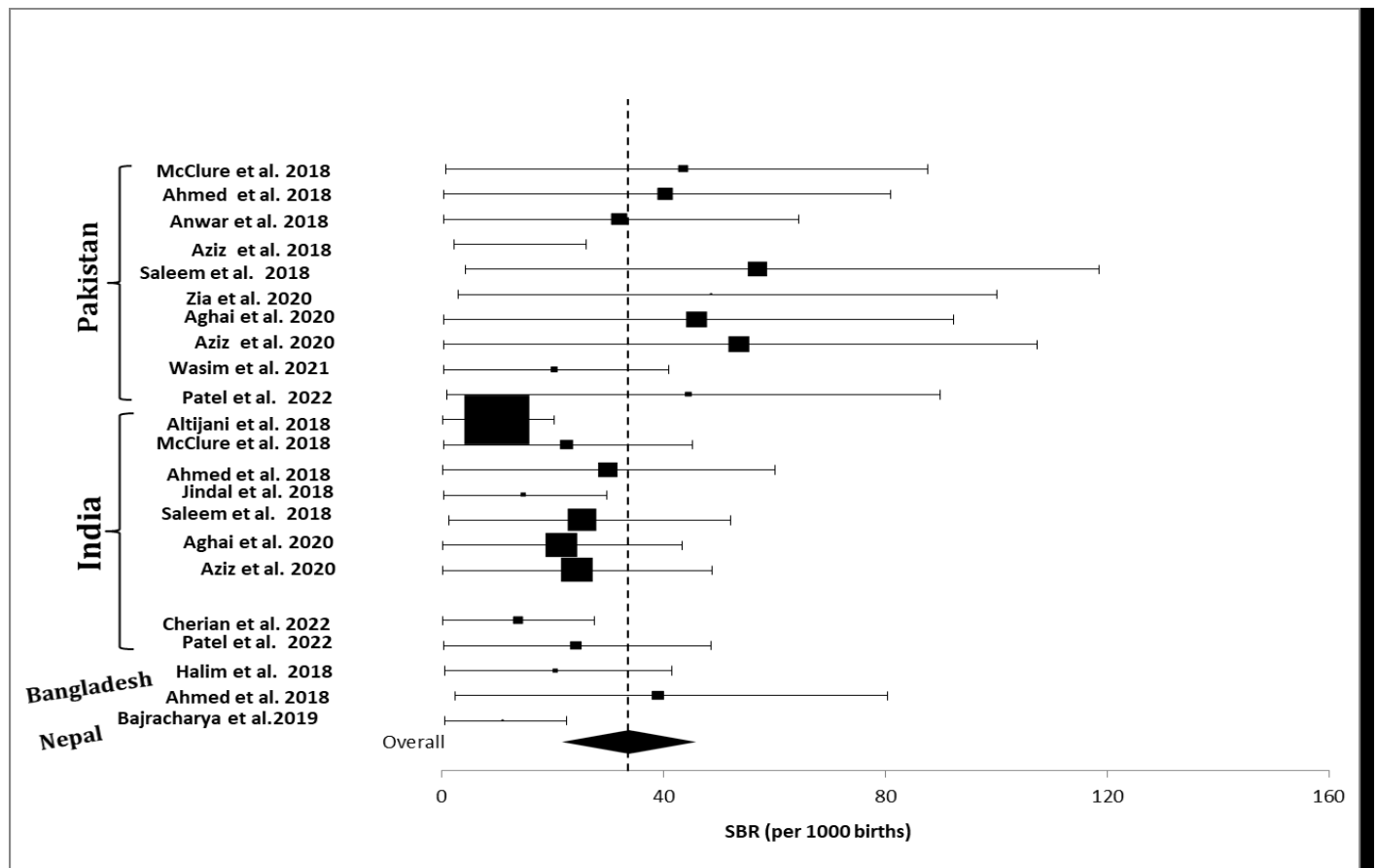* Average calculated from available values

- Outcome not measured

Figure 4: Forest plot for stillbirth rates across the included studies

DISCUSSION:

This systematic review underscores the urgent need to improve the quality of maternal and newborn care in Pakistan to address the disproportionately high burden of perinatal deaths in the country. Among the South Asian nations reviewed, Pakistan consistently had the worst perinatal mortality outcomes over the past decade. The perinatal mortality rate in Pakistan ranged from 58 to 91 per 1000 births, more than the rates in neighboring countries like India and Nepal. While recent data indicates a downward trend, Pakistan's PMR remains extremely high. This signifies that Pakistan has made insufficient progress toward the SDG target i.e. to eliminate the newborn deaths that are due to preventable factors by the year 2030.

In contrast, success stories like Bangladesh and Nepal demonstrate that reducing perinatal mortality is achievable through focused interventions and policies. Concrete action is now needed in Pakistan to implement evidence-based strategies that have worked in other South Asian contexts, such as increasing access to quality obstetric and neonatal care. Tackling underlying social determinants of health will also be critical as it has been reported in a study that antenatal care and institutional deliveries, as well as high SES, have a protective effect on perinatal mortality [27].

This review found high variability in reported morta-

lity rates between studies, possibly due to differences in study design and periods. However, Pakistan consistently showed the highest rates of stillbirth, neonatal mortality, and PMR compared to India, Bangladesh, and Nepal from 2010-2020.

There was inconsistency among studies included in this review from Pakistan. For instance, the studies by Aghai et al. and Patel et al. from 2010-2020 reported PMRs of more than 80 per 1000 births, while data from Wasim et al. found a PMR of 58.2 per 1000 births in 2016-2018. The stillbirth rates and the early neonatal mortality rates were also substantially higher compared to other countries. Most of the studies conducted in Pakistan reported stillbirth rates to be above 40/1000. Comparatively, the studies for Bangladesh reported the SBRs to be lower than 40/1000. However, the study conducted by Aziz S. et al. in Pakistan repor-ted the SBR to be 11.90/1000, much lower than the estimates of other studies. This is consistent with another study conducted by Afzal et al. that shows SBR to be 10.71 /1000 [28]. However, the results of these studies may not be replicated at national levels due to smaller sample sizes.

India showed a wide range of PMR estimates from 14 to 46 per 1000 births. The ENMR was also variable between studies. It indicates that national averages may mask differences in perinatal outcomes across Indian states and populations.

Pakistan has not yet achieved its MDG4 targets since no national policy in the country places a high priority on neonatal health. In contrast, other South Asian countries like Nepal and Bangladesh, in turn, met their respective MDG4 goals in 2010 and 2012 [29]. A systematic review that compares the rates of neonatal deaths and postnatal care for babies in Pakistan and other LMICs in Asia and Africa states that Pakistan had the highest neonatal demise rate among these nations while also having the highest percentage of after-birth-newborn-care (37%). The situation of Pakistan in this study demonstrates that expanding healthcare access without improving the caliber of care cannot be expected to have any discernible effects on newborn survivability[7].

To achieve the SDG targets, Pakistan urgently needs to increase investments in maternal and child health programs and services, with a focus on perinatal health. Most neonatal deaths in our nation are linked to preventable factors including sepsis and birth asphyxia. That's why, much more work must be done to improve neonatal care, improve mothers' and girls' nutritional and educational status, and raise community awareness of the significance of prenatal evaluations[30]. The success of Pakistan's next generation depends on taking immediate action to address this major public health crisis of high perinatal mortality.

The strength of this review is the focus on recent data since 2018 from multiple South Asian countries. However, differences in study designs, populations, and periods limit the comparability of mortality estimates between countries. Many studies had small sample sizes and were facility-based, so may not represent true population-level national estimates.

CONCLUSION:

This systematic review highlights Pakistan's alarming burden of perinatal deaths compared to neighboring South Asian nations. Over 2010-2020, Pakistan's perinatal mortality rate ranged from 58-91 per 1000 births – almost double the global average. Meanwhile, India, Bangladesh, and Nepal have made greater progress in reducing perinatal mortality. Strategies that have worked elsewhere in South Asia, like investments in maternal and newborn healthcare access and quality, must be implemented urgently. Pakistan can and must achieve the SDG target of ending preventable newborn deaths. The time for action is now.

ACKNOWLEDGMENTS:

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