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Health disparity at the intersection of religion and caste: Evidence from India

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ABSTRACT

Objective: The provisions and recognition of Schedule Castes (SCs), the constitutional term for the Dalits in India, have been exclusively extended to Hindus, Buddhists, and Sikhs (HBS). Omission of Dalit Muslims and Christians (MC) from the SC category stripped them of the affirmative action benefits tied with the SC status. This study aimed to explore how such differential treatment might play a role in differential health outcomes in Dalit women in India.
Methods: Drawing data on 177,346 Dalit women, aged 20 to 49 years, from two successive nationally representative surveys, we assessed the differential likelihood of hypertension and diabetes, between MC- and HBS-Dalit women. Accounting for birth cohort-, survey wave-, and state of residence- fixed effects, along with socioeconomic conditions and cardiometabolic risk factors, we obtained adjusted odds of having hypertension and diabetes in MC women. To check the validity of our results, we conducted similar analyses using data on 170,889 Scheduled Tribe (ST) women, another marginalized group, whose ST-status recognition were not tied to religion.
Results: We found that Dalit MC women were 1.13 (95% CI: 1.03–1.25) and 1.19 (95% CI: 1.05–1.36) times more likely to have hypertension and diabetes, respectively, compared to Dalit HBS women. Conversely, no statistically significant differential likelihood of these conditions was observed between MC and HBS women in the ST sample.
Conclusion: Our investigation thus, indicated a potential link at the crossroads of religion and caste that may contribute to the health disparities among marginalized women in India.

1. Introduction

The caste system in India is deeply rooted in ancient history and has colossal influence on many spheres of the modern Indian society [1]. Caste disadvantages include lower -access to education, −employment opportunities, and -political representation [2] as well as inequitable healthcare -access [3] and -utilization [4], and poor health outcomes [5]. Though originated within the practice of Hinduism, the designation of caste-based identity has been passed down through heredity, impacting the lives of individuals of other religions in present days.

The fundamental characteristics of the Indian caste system are marked by a well-defined hierarchy across different caste groups, inheritance of caste status, and strict practice of endogamy [6]. According to the Hindu scriptures, society is structured into four major hierarchical categories called *varnas,* which are traditionally associated with specific occupations or social functions. These *varnas* include *Brahmins* (priests), *Kshatriyas* (warriors and rulers), *Vaisyas* (traders and artisans), and *Shudras* (serfs and laborers). The lowest ranking Hindu castes, commonly referred as “Dalits”, are considered underneath the *Shudras* and exist as an independent ‘fifth’ category outside the *Varna* framework [7]. In addition, Indian society is stratified into *jatis*, which are geographically and hierarchically ranked kinship groups aligned with the basic characteristics of the *Varna* structure and serve as the operational units of the caste system in the current era [8,9].

Despite a commendable progress in achieving persistent economic growth in the past two decades, India has been experiencing critical challenges in the fronts of human development indicators and health outcomes [10]. This may, to some extent, be attributable to the complex

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nexus of caste, class, gender, and regional differences, coinciding with the unsettling inequities that underlie the population-level indicators [11–13]. The caste system, in particular, serves as a crucial factor in determining social marginalization and progress in the Indian population [14,15]. The picture gets further complicated when religion intersects with different caste groups.

The Dalits were appended in a Schedule in 1935 for the purposes of statutory safeguarding and provision of other benefits [16]. This resulted in adaptation of the term Scheduled Caste (SC), which was later incorporated in the Constitution of India as a social category in multiple provisions (for example, Articles 330, 332, 334, 335, and 341). According to the estimates of the Pew Research Center, around 25% of the population in India self-identify them as SC [17]. The SC status is associated with a major benefit of public sector employment quota, which has a critical influence on economic wellbeing of the disadvantaged population [18]. A proportion of seats in the higher educational institutions are also reserved for the SC population [19]. The Schedule Castes Development (SCD) Bureau within the Ministry of Social Justice and Empowerment in India extends several other benefits for the welfare of SCs to promote their educational, social, and economic empowerment. These benefits encompass various forms of support, including educational assistance through scholarships, initiatives like the Scheduled Castes Sub Plan (SCSP) designed to provide financial and physical benefits, and multiple healthcare support plans [20].

Despite castes being generally recognized as a hereditary characteristic, which extends beyond the religious boundaries, the benefits entitled to SC individuals were reserved solely for the Hindus, as the Constitutional Order of 1950 reads: “no person who professes a religion different from Hinduism shall be deemed to be a member of the SCs” [21]. Later, Sikhs and Buddhists were included in the SC category in 1956 and 1990, respectively, as these religions were perceived to be subsidiaries of Hinduism, per Article 25(2)(b). This provision, however, was not extended to Abrahamic religions like Christianity and Islam, posing a challenge to the principles outlined in Articles 14 and 15 of the Constitution, which advocate for equality and non-discriminatory practices based on religion [22,23].

In India, the caste-based discriminations transcend religious boundaries [24]. Exclusion of Dalit Christians and Muslims from the SC status, and thereby limiting their eligibility of any affirmative action benefits, therefore, may further exacerbate their psychosocial wellbeing. This paper intended to explore potential influence of such exclusion on health outcomes among Dalit Christians and Muslims. We built on the idea that interconnectedness of social identities is mutually linked to various structural factors, such as access to material resources, quality education and economic opportunities, which can play a pivotal role in determining health outcomes [25,26]. As such, health disparities may arise from individual experiences at the intersections of multiple social hierarchies [27,28].

The idea of intersectionality, originally propounded by Kimberley Crenshaw, emphasizes the lived experiences of individuals occupying multiple positions simultaneously. These intersecting identities may exert complex influence on individual’s health outcomes [29]. Applying this framework of intersectionality of social identities in the Indian context, we aimed to assess whether Dalit -Christian and -Muslim women, who were not officially recognized with the SC status, had a differential risk of having two most common cardiometabolic conditions – hypertension and diabetes, compared to Dalit -Hindu, -Buddhist, and -Sikh women, who were entitled to benefits associated with the SC status. In doing so, we utilized secondary data from nationally representative surveys, where women self-reported their religious identity and caste. We hypothesized that among women who self-identified them as SC in the surveys, those who reported Christianity or Islam as their religion, would have a higher likelihood of hypertension and diabetes, compared to women who reported Hinduism, Buddhism, or Sikhism as their religion.

In India, an estimated 32.6% women (age 20+ years) had hypertension and 10.7% had diabetes [30]. The distribution of the burden, however, was uneven across different socioeconomic groups [31]. For example, urban women showed a higher prevalence of hypertension (30.2% vs. 25.4%) and diabetes (14.7% vs. 8.1%) as compared to their rural counterparts [32]. Evidence also suggests macro-level associations between prevalence rates and socioeconomic and lifestyle indicators manifested by human development- and social development- indices [33]. Further, socioeconomic inequities were observed in awareness, treatment, and control of hypertension and diabetes [34,35].

Previous studies, in different country settings, have shown a role of intersectionality on population level hypertension and diabetes outcomes. A study on Canadian adults showed how population level risk of hypertension varied by the three-way interaction between race, gender, and income [36]. Another study on Brazilian adults documented the differential risk hypertension incidence at the intersection of gender and race/skin color [37]. The intersectional approach entailing socioeconomic and demographic attributes was utilized in assessing the risk of diabetes in a large sample of Swedish population [38]. Further, intersectionality between socioeconomic positions and race and ethnicity was found associated with glycemic control in youth with type-1 diabetes in the United States [39]. Considering these studies, applying intersectionality between caste and religion, therefore, is deemed viable to assess the risk of hypertension and diabetes in our study population.

The underlying assumption behind our hypothesis was that the differences in cardiometabolic outcomes between the two groups were due to the differential lived social experiences [40], stemming from the intersection of caste and religious identities. As mentioned earlier, Dalit -Christians and -Muslims in India experience severe social disadvantage since they are denied benefits of reservations in public-sector jobs and admission quotas in educational institutions [41,42]. Not being eligible for the SC benefits results in an added layer of marginalization for this group through unequal access to education-, employment-, and income-opportunities compared to their Hindu, Buddhist, and Sikh counterparts [43].

For validation of our analytical approach, we further assessed the hypothesis that no differential likelihood of hypertension and diabetes, conditional on sociodemographic and anthropometric attributes, existed between Muslim/Chrisitan women and their Hindu/Buddhist/Sikh counterparts, who self-identified them as members of any Scheduled Tribes (STs). The STs, whose status are also safeguarded in the Constitution, are comparable disadvantaged social groups to SCs in India [44]. However, unlike the SC status, the constitutional recognition and associated benefits of the ST status are not subject to any religious identity. As such, intersection of religion and ST status was not supposed to impact the conditional likelihood of hypertension and diabetes. Therefore, a null association in the ST sample, and a statistically significant association in the SC sample could be deemed supportive of existing health disparities associated with the nexus between religion and caste in our study population.

2. Methods

2.1. Data

This was a secondary data analysis of repeated cross-sectional data from two successive survey waves. We used data on 177,346 SC- and 170,090 ST- women aged 20 to 49 years from the 2015–16 and 2019–21 waves of the India National Family Health Survey [45,46]. The NFHS is a nationally representative survey that provides information on sociodemographic characteristics and health outcomes of reproductive-aged women in India. We used publicly available anonymized secondary data, which met the definition of the National Institutes of Health (NIH) exempt human subject research. Ethics committee approval for this study, therefore, was not required. The original survey protocol of the NFHS was reviewed and approved by the institutional review boards of

International Institute for Population Sciences (IIPS) and the ICF, and informed consents were obtained prior to the interviews [45,46].

We matched women by birth year across the two NFHS waves and grouped respondents in five birth cohorts as follows: i) 1969–1974, ii) 1975–1979, iii) 1980–1984, iv) 1985–1989, and v) 1990–1996. As such, we observed respondents within a birth cohort across two points of time and were able to account for birth cohort fixed effects while assessing the likelihood of having hypertension and diabetes.

2.2. Measures

Based on women's self-reporting of caste, we denoted study participants as Hindu/Buddhist/Sikh SC women and Muslim/Chrisitan SC women, though the SC status of the latter group was not officially recognized. This essentially meant that women in the latter group were of similar hereditary background, but not entitled to any affirmative action benefits like women in the former group. Similar determination was used in a previous study that explored the role of intersectionality of religion and caste on children's growth outcomes in India [47].

In both waves of the NFHS, respondents' blood pressure was measured using Omron Blood Pressure Monitor, three times during a single visit, with at least five minutes interval between each reading. A woman was determined to have hypertension if average systolic blood pressure (SBP) $\geq$ 140 mmHg or average diastolic blood pressure (DBP) $\geq$ 90 mmHg or taking antihypertensive medication at the time of the survey [45,46]. Our primary outcome variable for hypertension thus was a binary variable indicating whether a woman was hypertensive or not.

Respondents' random blood glucose level was measured using FreeStyle Optium H glucometer in the NFHS-4 and Accu-Chek Performa glucometer in the NFHS-5. Respondents were also asked if they had diabetes. A woman was determined to have diabetes if random blood glucose level was $\geq$200 mg/dl [48] or she reported to have diabetes. Our outcome variable for diabetes thus was a binary variable indicating whether a woman was diabetic or not.

For sensitivity analysis, we considered a secondary outcome variable based on the blood pressure levels as follows: i) normal: SBP < 120 mmHg and DBP < 80 mmHg, ii) pre-hypertensive: SBP 120–139 mmHg or DBP 80–89 mmHg, iii) hypertensive – mildly elevated: SBP 140–159 mmHg or DBP 90–99 mmHg, iv) hypertensive – moderately elevated: SBP 160–179 mmHg or DBP 100–109 mmHg, and v) hypertensive – severely elevated: SBP $\geq$ 180 mmHg or DBP $\geq$ 110 mmHg [45,46]. Our secondary outcome variable for hypertension thus, was a categorical variable with five categories of blood pressure levels. Such categorization for random blood glucose level, however, was not available [48].

Our key exposure variable was a binary variable indicating whether respondent's reported religion was Muslim/Christian (MC) or Hindu/Buddhist/Sikh (HBS).

2.3. Statistical analysis

Statistical analyses were conducted separately for the SC and ST samples. We first estimated hypertension and diabetes prevalence rates by MC and HBS, for each birth cohort of the SC- and ST- women. We performed adjusted Wald tests to examine whether the rates differed between MC and HBS women within respective groups.

Next, we estimated multivariable binomial logistic regression models to assess the likelihood of hypertension and diabetes for MC women compared to their HBS counterparts. We estimated two specifications – one accounting for survey wave fixed effects and state of residence fixed effects only (henceforth, unadjusted model), and the other accounting for birth cohort fixed effects, sociodemographic attributes, and hypertension and diabetes risk factors, in addition to survey wave- and state-fixed effects (henceforth, adjusted model).

The sociodemographic correlates included marital status, educational attainment, household wealth index quintiles, and urban/rural residence. These were common set of covariates used in extant literature on hypertension and diabetes in India [49,50]. Of note, we did not include age as a separate covariate since birth cohort fixed effects and survey wave fixed effects together captured the variations in age. The hypertension risk factors included tobacco use, alcohol use, parity (i.e., number of children born), random blood glucose levels, and body mass index (BMI). Diabetes risk factors included in the model were the same except for random blood glucose levels. These covariates were controlled in the model for the purpose of obtaining an unbiased estimate of the relationship between religious identity and hypertension and diabetes in SC and ST women. All covariates included in the model were categorical variables. Categories of each variable are listed in Table 1.

Lastly, we estimated multivariable multinomial logistic regression models to assess the relative risks of having blood pressure at pre-hypertensive, and mildly-, moderately-, and severely- elevated levels for the MC indicator, relative to the base outcome of having bloods pressure at normal level. Both unadjusted and adjusted specifications were estimated. Robust standard errors for all analyses were obtained by clustering at the state level. The level of significance was set at 5% level. Analyses were performed using Stata 18.0 software.

3. Results

In our sample, 7249 (4.1%) out of 170,097 SC women and 66,267 (39.0%) out of 170,090 ST women reported their religion as MC. Table 1 presents the sociodemographic characteristics and hypertension risk factors of SC- and ST- women by MC and HBS groups. While educational attainment and household wealth distribution were relatively similar across the MC and HBS groups in the SC sample, greater share of MC women in the ST sample had higher educational attainment and were from wealthier households, compared to their HBS counterparts. In both SC and ST sample, greater share of MC women resided in the rural areas.

Among risk factors, tobacco and alcohol consumption were similar across MC and HBS women in the SC sample. Tobacco use, however, was significantly higher among MC women in the ST sample. Alcohol consumption among MC women, on the other hand, was relatively lower compared to HBS women in the ST sample. While blood glucose levels were relatively similar across MC and HBS women, greater share of MC women had overweight/obesity in both SC and ST samples (Table 1).

Hypertension prevalence in the SC and ST sample was 15.1% and 16.8%, respectively. While the prevalence was 14.9% among HBS women in the SC sample, it was 3.6 percentage points (pp) (95% CI: 2.0–5.1) higher among MC women. In the ST sample, the prevalence was 16.0% and 18.1% among HBS and MC women, respectively, the difference, however, was not statistically significant ($\Delta = 2.2$ pp., 95% CI: −1.4–5.7).

Prevalence of diabetes was 2.7% among SC women, and 1.7% among ST women. While 2.1% HBS women in the SC sample had diabetes, the prevalence was 1.5 pp. (95% CI: 0.8–2.2) higher among MC women. In the ST sample, diabetes prevalence among MC women was 2.0%, which was 0.5 pp. (95% CI: 0.1–0.9) higher than that of 1.5% among HBS women.

Prevalence rates across birth cohorts are presented in Fig. 1. In both SC and ST sample, hypertension and diabetes prevalence were the highest for the oldest birth cohort and gradually declined in later birth cohorts. Within each birth cohort in the SC sample, MC women had statistically significant higher prevalence of hypertension compared to their HBS counterparts. For example, hypertension prevalence among MC women was 5.8 pp. (95% CI: 2.6–8.9) and 2.3 pp. (95% CI: 0.6–4.0) higher than that of HBS women in the 1969–74 and 1990–96 birth cohorts, respectively. Differences in hypertension prevalence between MC and HBS women in the ST sample, on the other hand, were smaller and not statistically significant in any birth cohorts. Except for the youngest birth cohort, the higher prevalence of diabetes among MC women, compared to their HBS counterparts in the SC sample, was evident across

Table 1
Descriptive statistics – percentage of women by groups.

	Scheduled Caste			Scheduled Tribe		
	All	Hindu/ Sikh Buddhist/	Muslim/ Christian	All	Hindu/Sikh Buddhist/	Muslim/ Christian
Survey wave						
2015–16	49.50	49.72	44.54	51.17	50.17	52.72
2019–21	50.50	50.28	55.46	48.83	49.83	47.28
Birth cohort						
1969–1974	16.18	16.21	15.68	15.86	15.72	16.08
1975–1979	16.35	16.36	16.00	16.55	16.48	16.66
1980–1984	18.97	18.95	19.46	18.91	18.78	19.11
1985–1989	20.82	20.83	20.51	20.87	20.91	20.81
1990–1996	27.68	27.66	28.33	27.81	28.11	27.34
Marital status						
Never in union	7.66	7.58	9.66	12.14	8.27	18.21
Married	86.51	86.62	83.93	81.37	85.65	74.68
Widowed/divorced/separated	5.83	5.80	6.41	6.49	6.09	7.11
Education						
No education	38.03	37.90	40.85	36.51	47.81	18.81
Primary	16.02	16.07	14.94	15.38	15.05	15.88
Secondary	37.11	37.14	36.36	40.19	31.41	53.94
Higher	8.84	8.89	7.85	7.93	5.73	11.37
Wealth Index						
Q1: poorest	22.64	22.81	18.64	34.32	43.50	19.94
Q2: poorer	23.95	23.98	23.20	26.66	26.34	27.15
Q3: middle	22.44	22.30	25.76	19.21	16.26	23.83
Q4: richer	18.13	18.00	21.19	13.05	9.50	18.62
Q5: richest	12.84	12.91	11.22	6.76	4.40	10.46
Residence						
Rural	74.89	75.16	68.46	83.19	89.04	74.03
Urban	25.11	24.84	31.54	16.81	10.96	25.97
Tobacco use						
No	91.26	91.26	91.21	76.15	82.36	66.43
Yes	8.74	8.74	8.79	23.85	17.64	33.57
Alcohol drinking frequency						
Never	98.77	98.79	98.14	91.42	89.51	94.40
Almost every day	0.21	0.21	0.29	1.13	1.50	0.54
About once a week	0.45	0.44	0.77	3.61	4.64	1.99
Less than once a week	0.57	0.56	0.80	3.85	4.34	3.07
Parity						
0	12.54	12.44	14.94	16.97	13.67	22.12
1–2	41.65	41.72	40.02	38.46	41.59	33.56
3–4	34.64	34.73	32.43	33.07	34.40	30.98
5+	11.18	11.12	12.61	11.50	10.34	13.33
Blood glucose level						
Normal ($\leq$ 140 mg/dl)	92.83	92.91	91.08	93.49	93.85	92.93
High (141–160 mg/dl)	3.91	3.88	4.53	4.05	3.87	4.32
Very high (> 160 mg/dl)	3.26	3.21	4.39	2.47	2.28	2.75
BMI category						
Normal (18.5–24.9)	59.52	59.67	55.98	66.69	63.15	72.26
Underweight (< 18.5)	17.92	18.08	14.05	17.75	23.80	8.26
Overweight (25.0–29.9)	17.30	17.13	21.45	12.96	10.75	16.42
Obese ($\geq$ 30.0)	5.26	5.13	8.52	2.59	2.30	3.06
Observations	177,346	170,097	7249	170,089	103,822	66,267

Note: Shares add to 100 across rows for respective characteristics. Blood glucose level was missing for 1673 women in the SC sample and 1459 women in the ST sample. BMI measure was missing for 546 women in the SC sample and 369 women in the ST sample.

all other birth cohorts. In the ST sample, except for one birth cohort (1975–79), no statistically significant differences in diabetes prevalence between MC and HBS women were observed.

Results of the binomial logistic regression models are presented in Table 2. The odds of having hypertension for MC women in the SC sample were 1.16 times that of their HBS counterparts. The adjusted odds were very similar, 1.13, when sociodemographic correlates and hypertension risk factors were accounted for. Conversely, the odds in the ST sample were close to 1.00 (0.96 and 0.97) and were not statistically significant. The unadjusted and adjusted odds of having diabetes for MC women in the SC sample were 1.28 and 1.19 times that of their HBS counterparts. On the other hand, no statistically significant differences in odds of having diabetes were found between MC and HBS women in the ST sample.

Relative risk ratios of blood pressure levels, relative to the base outcome of normal range, are presented in Table 3. The adjusted relative risks of having blood pressure at pre-hypertensive, mildly elevated, and moderately elevated levels were 1.15, 1.13, and 1.38 times respectively for MC women in the SC sample, compared to those of HBS women. While the unadjusted relative risk of having blood pressure at severely elevated level for MC women was 1.29 times that of HBS women, the adjusted relative risk ratio was not statistically significant. On the other hand, no statistically significant differential risks of any blood pressure levels were found for MC women in the ST sample.

4. Discussion

The caste system, or the hierarchical social structure based on occupations, social functions, and geographically and hierarchically ranked kinship, is deeply rooted in the Indian society. Though originated

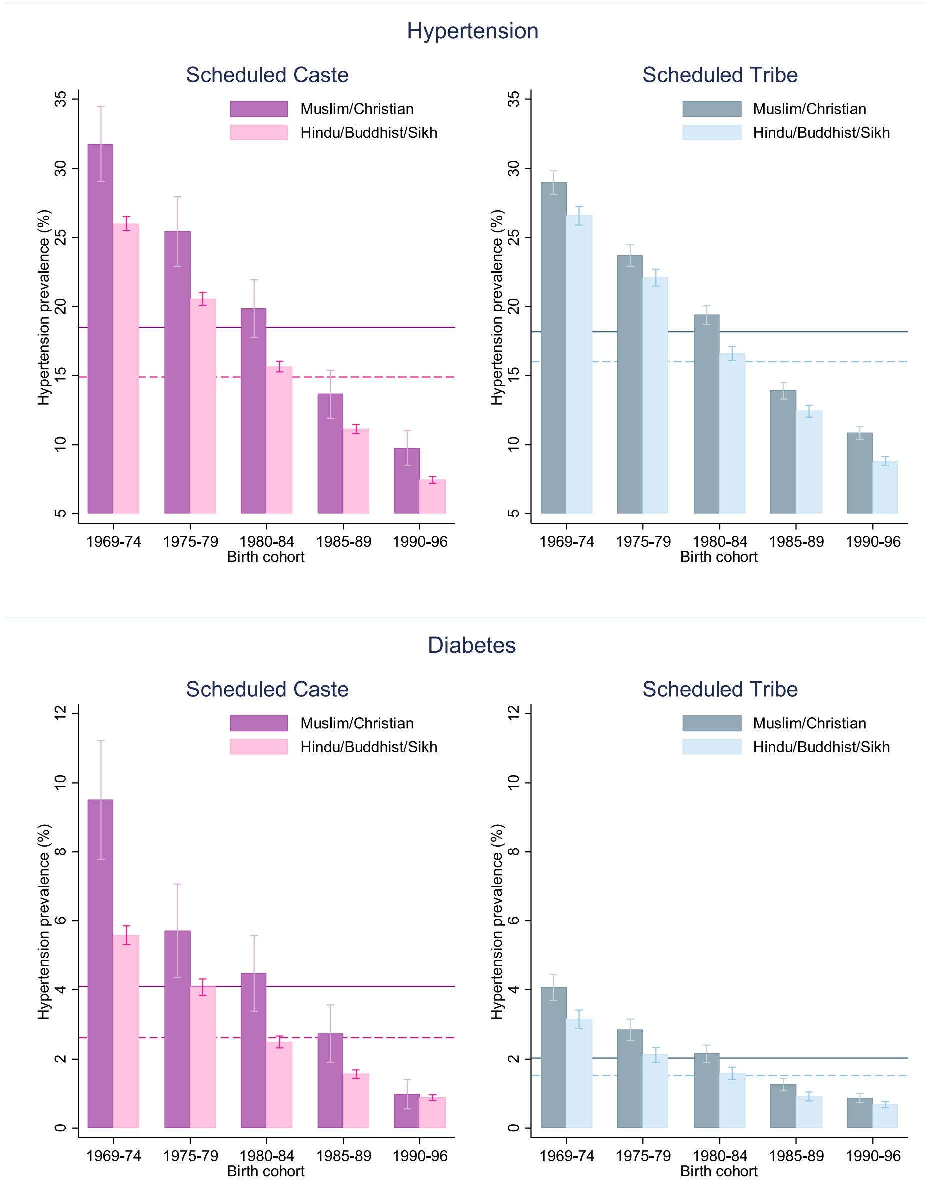

Fig. 1. Hypertension and diabetes prevalence by religious identity and birth cohort.
Note: The solid horizontal line is the prevalence for Muslim/Christian in respective (i.e., SC or ST) full sample. The dashed horizontal line is the prevalence for Hindu/ Buddhist/Sikh in respective (i.e., SC or ST) full sample.

and practiced in the Hindu society, the division of castes remained in existence in other religions through heredity, across generations. For example, if someone's ancestor belonged to a certain caste in the traditional Hindu society, that individual is socially treated as affiliated to that same caste even if converted to some other religion than Hinduism [51]. In this study, we assessed whether the intersection of caste and religion was associated with differential health outcomes in women in India. In particular, we examined whether the likelihood of having two most common cardiometabolic conditions – hypertension and diabetes differed by religious identity (i.e., Muslim/Christian vs. Hindu/ Buddhist/ Sikh) among women who belonged to the lower ranked castes referred as Dalits or Scheduled Castes.

Despite having similar hereditary background, the lived social experiences of Dalit women of different religious identities were not same. In the Constitution of India, SC individuals are entitled to certain affirmative action benefits, which, however, are preserved for Hindus, Buddhists, and Sikhs only, and not available to Muslims and Christians. In other words, the official SC status for Muslim and Christian individuals of similar hereditary background is not recognized by the Government, and thereby they are not entitled to any associated affirmative action benefits. On the contrary, the caste-struggle experienced by Muslim and Christian individuals, whose ancestors belonged to a lower caste, is no different than that of their Hindu, Buddhist, and Sikh counterparts in the modern Indian society [24]. As such, the nexus of caste and religion creates further inequities within the castes. Against this backdrop we found that Muslim- and Christian- Dalit women, who by law were not entitled to SC affirmative action benefits, had a higher likelihood of having hypertension and diabetes, compared to Hindu-, Buddhist-, and Sikh- Dalit women, who had constitutional protections on their SC status.

We also found that Muslim and Christian women of Scheduled Tribes, whose status and corresponding affirmative action benefits were not limited by religious identity, did not have any differential odds of having hypertension and diabetes compared to their Hindu-, Buddhist-,

Table 2
Odds of hypertension and diabetes from binomial logistic regression.

	Unadjusted		Adjusted	
	Scheduled Caste	Scheduled Tribe	Scheduled Caste	Scheduled Tribe
A. Hypertension				
Religion				
Hindu, Buddhist, Sikh	Ref.	Ref.	Ref.	Ref.
Muslim or Christian	1.160** (1.046, 1.288)	0.957 (0.804, 1.141)	1.134* (1.029, 1.251)	0.972 (0.835, 1.132)
Survey wave fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Birth cohort fixed effects	No	No	Yes	Yes
Sociodemographic controls	No	No	Yes	Yes
Hypertension risk factor controls	No	No	Yes	Yes
Observations	177,346	170,089	175,142	168,280
B. Diabetes				
Religion				
Hindu, Buddhist, Sikh	Ref.	Ref.	Ref.	Ref.
Muslim or Christian	1.277*** (1.150, 1.417)	1.171 (0.976, 1.406)	1.194** (1.053, 1.355)	1.164 (0.922, 1.470)
Survey wave fixed effects	Yes	Yes	Yes	Yes
State fixed effects	Yes	Yes	Yes	Yes
Birth cohort fixed effects	No	No	Yes	Yes
Sociodemographic controls	No	No	Yes	Yes
Hypertension risk factor controls	No	No	Yes	Yes
Observations	175,673	168,630	175,142	168,280

Note: 95% confidence intervals are in parenthesis. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Standard errors were clustered at the state level. Sociodemographic controls include marital status, urban/rural residence, educational attainment, and household wealth index quintiles. Hypertension risk factors include random blood glucose level, body mass index categories, parity (i.e., number of children born), tobacco use and frequency of alcohol use.

Table 3
Relative risk ratios of blood pressure levels from multinomial logistic regression.

	Pre-hypertensive	Hypertensive		
		Mildly elevated	Moderately elevated	Severely elevated
A. Scheduled caste - unadjusted				
Religion				
Hindu, Buddhist, Sikh	Ref.	Ref.	Ref.	Ref.
Muslim or Christian	1.155**	1.161*	1.396**	1.287*
	(1.045, 1.276)	(1.034, 1.303)	(1.134, 1.718)	(1.014, 1.634)
B. Scheduled tribe - unadjusted				
Religion				
Hindu, Buddhist, Sikh	Ref.	Ref.	Ref.	Ref.
Muslim or Christian	0.897	0.864	0.939	0.896
	(0.794, 1.013)	(0.711, 1.049)	(0.754, 1.170)	(0.619, 1.297)
C. Scheduled caste - adjusted				
Religion				
Hindu, Buddhist, Sikh	Ref.	Ref.	Ref.	Ref.
Muslim or Christian	1.145*	1.125*	1.376**	1.223
	(1.029, 1.273)	(1.006, 1.258)	(1.116, 1.696)	(0.832, 1.798)
D. Scheduled tribe - adjusted				
Religion				
Hindu, Buddhist, Sikh	Ref.	Ref.	Ref.	Ref.
Muslim or Christian	0.909	0.890	0.940	0.878
	(0.811, 1.018)	(0.750, 1.056)	(0.770, 1.148)	(0.593, 1.298)

Note: 95% confidence intervals are in parenthesis. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$. Standard errors were clustered at the state level. Normal blood pressure level was the base category. All models account for survey-wave fixed effects and state fixed effects. Adjusted models, in addition, accounted for sociodemographic controls including: marital status, urban/rural residence, educational attainment, and household wealth index quintiles; and hypertension risk factors including: random blood glucose level, body mass index categories, parity (i.e., number of children born), tobacco use and frequency of alcohol use.

and Sikh counterparts. Our results thus were supportive of health disparities in women at the intersection of caste and religion. These findings are comparable to those in literature that examined racial disparities in cardiometabolic risks and cardiovascular health outcomes [52,53], attributable to structural, interpersonal, and cultural racism [54]. We contribute to this strand of literature by reporting a similar relationship in a non-western setting, where we explored marginalization at the intersection of caste and religion in a nation that is rich in diversity and enmeshed in a complex social structure.

Our research delves into the recent significance of minority religious identity coupled with backward caste identity as a key component of social identity in India, within the framework of intersectionality. This inquiry was motivated by recent appeals to acknowledge its potential importance in understanding disparities in health outcomes within a diverse and multireligious society. Further, we wanted to add to the knowledge base of intersectional disparities shaped by politics and statutes in conjunction with conventional social factors such as education, income, and gender. Previous studies in such settings explored health outcomes at the intersections of caste and gender [3,55], caste and economic class [56], and caste and education [12]. Only one study till date assessed some forms of interaction between caste and religion on child health outcomes in India [47]. A such, our study would be among the initial studies that examine the health disparities in relation to caste and minority religions in the light of exclusionary policies against Muslim and Christian SCs within the Indian context.

Our results, however, should be cautiously interpreted due to some limitations. First, the SC and ST status was self-reported by the survey participants and was not validated using any government issued documentation. This self-reported determination of caste status, however, has been previously used in literature [12,47]. Second, assessment of hypertension and diabetes was based on measures of biomarkers during a single visit. These measures though could be deemed as reasonable proxies to the population level risks of these conditions [33,35]. Third, due to data constraint we could not account for factors such as family history of chronic conditions, which might impact hypertension and diabetes outcome in women. Lastly, self-reported responses to questions concerning stigmatized behaviors such as tobacco-use and alcohol-consumption could be subject to social desirability bias. Nevertheless, we accounted for a rich set of sociodemographic correlates as well as measured (i.e., not self-reported) risk factors such as BMI categories, which facilitated obtaining a plausible estimate of the relationship.

The key strength of our analyses, on the other hand, was that we explored the relationship in two socioeconomically similar groups (i.e., SC and ST) differed by statutory exclusion of certain religions from constitutional recognition and provisions of affirmative action benefits. Additionally, using data from multiple survey waves allowed us to account for birth cohort fixed effects, and thereby tackling potential confounding relationships across generations of women. Altogether, our results suggested strong evidence that intersectionality of religion and caste had significant association with health outcomes of marginalized women in India.

In a country as diverse as India, social status plays a critical role in access and utilization of healthcare services. Addressing the pervasive influence of caste discrimination, therefore, will be a major step forward to promoting health equity, especially among the subgroup of *doubly* marginalized women in India. This, however, will require a strong political will and consensus, which seems far-fetched given the current political polarization in India. While at the upstream, policy changes such as expanding eligibility for affirmative-action benefits may take time, downstream interventions at the community level could help mitigating the extent of health disparities [57]. Initiatives aimed at fostering community engagement to educate women about health-promoting- and health-risk- behaviors, and to implement health-behavior change interventions could serve as primary protections against the risk of hypertension and diabetes. Further, strengthening health-services delivery at the community level could help effective management of hypertension and diabetes among marginalized women. However, a thorough need assessment for hypertension and diabetes care at the community level is warranted to strategize appropriate interventions. Future research may explore this avenue, considering the multifaceted layers of marginalization encompassing caste, religion, and other sociodemographic attributes.

5. Conclusion

Our investigation revealed that Dalit -Muslim and -Christian women, who were not legally eligible for affirmative action benefits of the SC status, had a greater probability of experiencing hypertension and diabetes. This was in contrast to the Dalit -Hindu, -Buddhist, and -Sikh women, who were safeguarded by constitutional provisions regarding their SC status. Further, no differential likelihood of having hypertension and diabetes was observed between Muslim/Christian and Hindu/Buddhist/Sikh women who belonged to any STs, constitutional recognition of which is not limited to religious identities. The findings thus indicate a robust link at the crossroads of religion and caste that may contribute to a wider health disparity. While the caste-based discriminations are well acknowledged, our results offer a new angle of intersectionality that potentially influence health outcomes of the *doubly* marginalized women in India. Our study, therefore, underscores a call for action in this matter, aimed at advocacy and further research to facilitate policy actions to promote health equity in this population.

Disclosure statement

The authors report there are no competing interests to declare.

Ethical approval

This research used publicly available anonymized secondary data that met the definition of NIH exempt human subject research (Exemption 4). Ethical approval, therefore, was not required.

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CRediT authorship contribution statement

Biplab Kumar Datta: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Supervision, Writing – original draft. **Shriya Thakkar:** Conceptualization, Investigation, Validation, Writing – original draft.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data used in this analysis are publicly available from the USAID's Demographic and Health Surveys (DHS) Program website: https://dhsprogram.com/data/.

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