Journal of Racial and Ethnic Health Disparities (2020) 7:987–995
https://doi.org/10.1007/s40615-020-00723-9

Caste Differences in Hypertension Among Women in India: Diminishing Health Returns to Socioeconomic Status for Lower Caste Groups

Jalal Uddin[1] · Sanjeev Acharya[2] · Jessica Valles[2] · Elizabeth H. Baker[2] · Verna M. Keith[2]

Received: 2 October 2019 / Revised: 4 February 2020 / Accepted: 6 February 2020 / Published online: 20 February 2020

Abstract

Introduction The caste system is a relatively rigid system of social hierarchy in India. The caste membership defines one's access to resources and life opportunities. A growing body of research suggests that lower caste groups have an excess burden of morbidity and mortality in India. However, it is not clear as to what extent caste differences in health are conditioned by socioeconomic status (SES) indicators.

Purpose This study examined the caste differences in hypertension and tested whether caste differences in hypertension are conditioned by education and household wealth in a representative sample of women in India.

Methods This study used data from the National Family Health Survey (NFHS) 2015–2016, India. The analysis is based on a nationally representative sample of 648,064 adult women aged 15–49 years. We used logistic regression to examine whether the association between caste and hypertension varied by education and wealth index using interactions and controlling for potential confounders.

Results The regression models suggest that scheduled tribes and non-caste members have the highest odds of hypertension compared with privileged upper caste members. Interaction models indicate complex intersections of caste, education, and wealth index. The predicted probabilities derived from these interaction models suggest that while SES indicators are inversely associated with the odds of hypertension, the inverse patterning was significantly weaker in other backward classes and more protective in non-caste members compared with upper caste. Additionally, caste difference in predictive risk of hypertension tends to diverge at the lower levels of SES and become narrower at the higher levels of SES.

Conclusions These findings provide evidence of differential returns to SES and have implications for understanding the causes of SES patterning in health among disadvantaged caste groups in India.

Keywords Caste system · Hypertension disparity · Socioeconomic status · Intersectionality · India

Introduction

Non-communicable diseases have surpassed infectious diseases as the leading cause of death in the global burden of disease (World Health Organization 2014). Hypertension is a serious risk factor for many non-communicable diseases and has become a major global public health concern [1, 2]. Hypertension is not only a common risk factor for cardiovascular diseases (e.g., atherosclerosis, heart disease, heart failure, stroke, and angina) but also peripheral vascular disease,

✉ Jalal Uddin
jalal@uab.edu

Sanjeev Acharya
asanjeev@uab.edu

Jessica Valles
jv1825@uab.edu

Elizabeth H. Baker
ebaker@uab.edu

Verna M. Keith
vmkeith@uab.edu

[1] Department of Epidemiology, University of Alabama at Birmingham, 533B RPHB, 1665 University Blvd, Birmingham, AL 35233, USA

[2] Department of Sociology, University of Alabama at Birmingham, 460 Heritage Hall Building, 1401 University Blvd, Birmingham, AL 35233, USA

retinopathy, nephropathy, dementia, and cognitive decline [3]. As life expectancy continues to increase in lower income countries, the prevalence of non-communicable and chronic conditions such as hypertension has been on the rise. The increase in the prevalence of hypertension is now growing faster in low-income countries than in industrially developed countries [4].

In India, the national prevalence rate of hypertension is 25%, and it has become the fourth leading risk factor for mortality and disability [5, 6]. Recent population-based studies have shown that the prevalence of hypertension is relatively higher in middle and older age groups across geographic location, education, and household wealth status [5]. Notably, in younger age groups, the hypertension prevalence rates are even higher for India than those for Central and Eastern Europe – a region where the prevalence of hypertension was previously deemed the highest in the world [7]. It is imperative to understand health in India, especially as it relates to hypertension. India is the second most populous country in the world and has a very young age structure. Given the higher prevalence of hypertension among young people in India and the risk factor that aging has on hypertension, this issue will likely be exacerbated in the coming decades as India's young population ages.

The caste system in India, based on religious and ideological grounds, has historically existed as both a system of exclusion and a status hierarchy that profoundly determines one's access to resources and life opportunities [8]. Caste is a social stratification system characterized by hereditary membership, endogamous marriage, and a specific style of life determining the ritual status and occupational pursuit [9, 10]. Based on the notions of purity and pollution, the caste hierarchy places the pure *Brahmins* (the dominant social group consisting of priests, teachers, doctors, and other white-collar professionals) on the top, *Kshatriyas* (rulers and warriors) and *Vaishyas* (businessmen) in the middle, and the impure ex-untouchables/*Dalits*, manual workers, and servants (forming the bulk of scheduled castes) at the bottom [9]. As the caste hierarchy is hereditary, change in the economic situation would rarely allow a lower caste group to ascend to a higher ritual status [11, 12]. A growing body of studies suggests that lower caste and indigenous people experience disproportionate rates of morbidity, mortality, and early onset of death in India [13–15]. Much of the caste differences in health outcomes are often attributed to the unequal distribution of socioeconomic resources [16]. However, there has been little research on the extent to which indicators of socioeconomic status (SES) such as wealth and education may condition the caste differences in chronic conditions in India.

Scholarship in social determinants of health has long argued that individuals' SES is the fundamental cause of social inequality in morbidity and mortality [17, 18]. The distinct indicators of SES provide people with varying degrees of access to *flexible resources*. SES, including education, wealth, occupational prestige, and geographic/residential context, can give access to an array of beneficial resources that, in myriad ways, help achieve our health goals. As Link and Phelan said, these resources can be used "to avoid disease risks or to minimize the consequences of disease once it occurs," regardless of underlying disease risk factors in a given circumstance (Link and Phelan 1995: s29). In essence, this implies that individuals with greater access to flexible resources such as money, knowledge, power, prestige, freedom, and beneficial social connections are better able and prepared to employ these resources as critical means to avoid or control risk factors of disease and mortality.

Although the beneficial role of SES is widely acknowledged, a growing body of studies demonstrates that the role of SES is not straightforward or does not function in a linear fashion across social stratification categories, including race/ethnicity, gender, and nativity status [19]. Recent research, particularly in the context of the USA, demonstrates a *diminishing returns* hypothesis, which posits that SES does not confer similar benefits across racial-ethnic groups, and especially marginalized racial-ethnic groups which tend to have diminishing returns to their higher SES [20–22]. One critical argument for this hypothesis is the evidence that even marginalized racial-ethnic groups with higher SES encounter institutional and everyday discrimination, racism, and race-related inequalities in various domains of life, which adversely impact their health [23, 24].

Much like the race-based discrimination and systems of inequality in the USA, caste-based discrimination and the processes of social and economic marginalization persistently characterize the life opportunities of the lower caste groups in modern India [25–29]. Caste-based economic deprivation, residential segregation, and humiliation persist in practice in contemporary India. For instance, despite reservation policies for lower caste groups, occupational segregation has remained relatively stable over generations [30, 31] such that lower caste groups consistently lag behind the upper caste concerning access to white-collar occupations, large businesses, and farm ownership classes [32]. Additionally, lower caste groups, especially those placed at the bottom, such as ex-untouchables/*Dalits* and manual workers continue to live in the segregated settlements in rural areas and slums in big cities, away from the upper caste and advantageous neighborhoods. Such residential segregation is mostly driven by caste status than it is by socioeconomic status [33, 34]. Some scholars note that these processes are less uniform and more fluid in contemporary India relative to the pre-independent colonial era [9, 35].

In the context of affirmative action in education (e.g., a quota system for scheduled caste, scheduled tribes, and other backward classes), caste disparities in education have been declining over time. However, non-caste members, such as

Muslims, do not seem to benefit from such affirmative action, as Muslims are not eligible for affirmative action [36]. Most interestingly, even within affirmative action target groups, there is persistent inequality at the intersection of gender and caste such that lower caste females benefit the least from affirmative action [37].

These processes of inequality and marginalization have placed lower caste groups, especially low-caste and low-SES females at a structural disadvantage given their multiple jeopardies at the intersections of caste, class, and gender. Although women's health is routinely examined in the intersectional literature, especially in the USA [38–40], few studies examined how the class position may condition caste differences in women's health in India.

Existing studies frequently examine social inequalities in adult health outcomes in India [13, 14, 41–44]. These studies consistently report a strong social patterning in health, showing that individuals with higher SES have better self-rated health and lower risk of chronic conditions and mortality. Further, lower caste members have worse health outcomes compared with upper caste members. While these studies are important in understanding the caste and SES disparities in health, less is clear whether and how social position indicators such as caste, gender, income, and education may intersect to shape health. In particular, prior studies rarely looked at how SES indicators can intersect with caste groups and thus create unique positions of disadvantages and health inequalities in India. Further, these processes may place low-caste women at a structurally disadvantaged position in society in such a way that even higher socioeconomic gains (e.g., wealth and education) might not equally translate to better health for them as compared with those in the upper caste groups. This study addresses this critical gap in the literature by examining caste differences in hypertension and the extent to which caste differences are conditioned by the key SES indicators such as wealth and education.

Data and Methods

We used de-identified data from the National Family Health Survey (NFHS) 2015–2016, India. The NFHS is a nationally representative population-based household survey. The NFHS follows a two-stage probability sampling strategy. The first stage of the sampling strategy includes the selection of villages as the primary sampling unit (PSU) in rural areas and census enumeration blocks (CEB) in urban areas. In the second stage, using systematic random sampling, 22 households were selected from each PSU and CEB, resulting in a total of 628,900 households, of which 601,509 households were finally selected for interviews. In the selected households, 723,875 women aged 15–49 were found to be eligible for an interview using the women's questionnaire. Of the total eligible women respondents, 699,686 women took part in the interviews with a response rate of 97%. After deleting cases with missing information on any of the variables included in the analysis, our analytic sample consisted of 648,064 women aged 15–49 years.

Outcome Variable

The survey used standardized protocols and field-friendly technologies to examine blood pressure (BP) [45]. Using the Omron Blood Pressure Monitor, BP was measured three times at five-minute intervals. We averaged the second and third measurement to determine the systolic and diastolic BP. Finally, we defined hypertension as having an average systolic BP of ≥ 140 mmHg, and/or diastolic BP ≥ 90 mmHg, and/or self-reported use of any antihypertensive medication. The recent clinical practice guidelines consider this definition as stage 2 and more severe hypertension [46].

Key Explanatory Variables

Social Caste

Social caste was based on the respondent's self-reports of whether they belong to one of the following categories: scheduled caste, scheduled tribe, other backward castes, and other castes. Despite substantial heterogeneity within each caste group, these broad caste groups are commonly used in public policy documents and monitoring population-level health, nutrition, and other outcomes [47–49]. Scheduled caste and scheduled tribe represent the most socially disadvantaged groups. In the traditional Hindu caste hierarchy, scheduled castes are the lowest castes (e.g., untouchables or *Dalits*). Broadly, scheduled caste represents a heterogeneous group of landless farmers, fishermen, sweepers, and washermen. Schedule tribes, for example, *Barda* in Gujarat or *Adiyan* in Kerala, are the distinct indigenous groups who are often geographically isolated from the mainstream society and dominant caste groups, and like the scheduled caste, they have the least social and economic status. As these two castes have historically been socio-economically disadvantaged, they receive some state-sponsored affirmative benefits. The other backward castes represent a group of historically disadvantaged castes similar in social status as scheduled caste and tribes. Respondents who do not belong to any of the above caste groups are grouped into a residual other category (hereafter refers to upper caste) representing the most advantageous caste in the traditional Hindu caste hierarchy. As a caste system is not applicable for Muslims, Christians, and Buddhists, we grouped them into a category referred to as non-caste. Previous studies also used a similar non-caste category and

found that the probability of infant mortality is higher among the non-caste group [14].

Socioeconomic Status (SES) Indicators

SES indicators include education and the wealth index. Education is based on self-reported completed years of education ranging from 0 to 20 years. The wealth index is a composite measure of a household's ownership of a wide range of assets (e.g., agricultural land, farm animals, radio, television, bicycle, computer, mobile phone, etc.), housing types (e.g., materials used for housing construction), furniture (e.g., bed, sofa, table, chair, etc.), and other dwelling resources (access to water, type of sanitation facility, electricity, refrigerator, etc.). The underlying assumption of the wealth index is that there is a continuum of economic status. A household's cumulative wealth represents its relative economic position in such a continuum of the economic status of a country. Broadly, households are given scores based on their ownership of the type and amount of assets. These scores are derived using the principal component analysis [50, 51] and each household is then assigned a continuous asset score. The average raw asset score in our sample was 2.47, with a standard deviation of 0.98. We stratified the samples into ten categories (deciles) according to these asset scores. Recent studies report that the use of wealth decile, especially when there is a larger sample size, estimates wider health inequalities between subgroups [52, 53].

Other Covariates

The analysis controls for several sociodemographic factors, health behaviors, and health conditions. Sociodemographic variables include current age of women (measured in years), marital status (married, widowed, divorced, and separated), and the place of residence (rural and urban). Health behaviors and conditions include current smoking status (yes/no), body mass index (a continuous variable calculated based on the anthropometric measures of weight and height), and random blood glucose (measured using a finger-stick blood specimen). For the blood specimen collection, the survey used Freestyle Optium H Glucometer with glucose test strips [47]. Blood glucose is used as a continuous variable.

Statistical Analysis

The analysis included 648,064 Indian women aged 15–49 years. We used logistic regression analysis to regress a binary outcome of hypertension on the caste categories controlling for the covariates listed above. The analysis followed a two-stage analytic approach. First, we ran two logistic models that examined the effects of caste categories with and without adjustments of SES measures (e.g., wealth score and education). Second, we modeled two-way interactions between caste and two measures of SES (e.g., education and wealth score) in the full sample controlling for the other covariates listed above. For the ease of interpretation, we presented the adjusted predicted probabilities (Figs. 1, 2) from the interaction models using the margins (atmeans) command in Stata. When caste was interacted with wealth scores, for the purpose of better visualization, predicted probabilities were presented by deciles of wealth scores. We used Stata version 15.1 (StataCorp LP, College Station, TX) for all analyses. The regression analysis used survey weights to adjust for the complex survey design.

Results

Characteristics of the Sample

Table 1 presents the distributions of sample characteristics by the five caste groups. The prevalence of hypertension was highest in non-caste (13.34%) group followed by upper caste (12.70%) and scheduled tribe (11.33%). Other backward classes (10.47%) and scheduled caste (10.45%) categories had a similarly low level of hypertension prevalence. In terms of wealth scores, the most privileged caste, the upper caste, had the highest average wealth score (0.66) with a standard deviation of 0.94 and scheduled tribe had the lowest average wealth score (−0.66) with a standard deviation of 0.82. The average years of education were highest among upper caste member (9.15 years) and lowest among scheduled tribe (4.64 years). The average years of age were about 30 years for all caste groups. The average BMI in each caste group was within the normal weight range (18.5–25), highest among upper caste (22.73) and lowest among scheduled tribe (20.37). The average level of glucose in each caste group

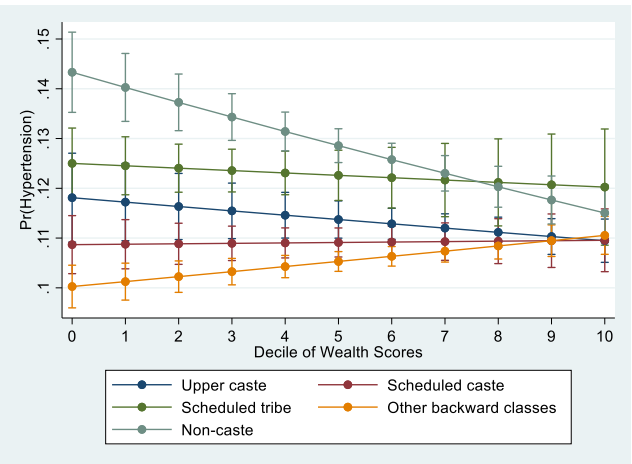

Fig. 1 Predicted probabilities and 95% confidence intervals of hypertension by deciles of wealth scores and caste

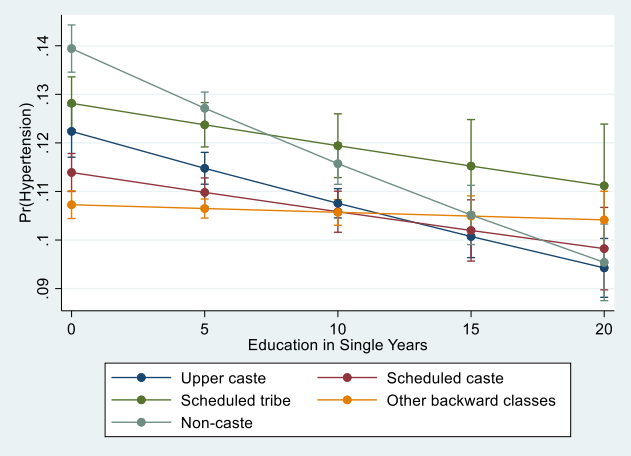

Fig. 2 Predicted probabilities and 95% confidence intervals of hypertension by education and caste

was also within the normal range (70–130 mg/dl), which was also highest among upper caste (105.31 mg/dl) and lowest among scheduled tribe (102.61 mg/dl). The majority of samples in each caste group were non-smokers and from rural areas (more than 62% in each caste category), and were married (over 66% in each caste category).

Caste Differences in Hypertension

Table 2 presents the odds ratios of hypertension obtained from logistic regression models. Model 1 accounts for the other covariates such as age, marital status, smoking, glucose, BMI, and type of residence. Examining Model 1, we find that compared with upper caste, both schedule tribe and non-caste women had higher odds of hypertension OR = 1.17, 95% CI: 1.11–1.24 and OR = 1.19, 95% CI: 1.15–1.25, respectively. However, other backward class women had lower odds of hypertension (OR = 0.96, 95% CI: 0.93–0.99). Model 2 includes wealth scores and education. After the adjustment for wealth and education, we find that associations of caste groups with hypertension remain robust, although odds ratios were slightly attenuated. Examining the SES indicators in model 2, we find that increasing education was associated with decreased odds of hypertension (OR 0.98, 95% CI 0.98–0.99).

Intersections with Caste, Wealth Index, and Education

Model 3 includes an interaction term between caste and wealth score, and model 4 includes an interaction term between caste and years of education, and both interaction terms were significant. For ease of interpretation, we obtained predicted probabilities of hypertension by caste and wealth deciles from these models and presented them in Figs. 1, 2. As presented in Fig. 1, overall, we see that caste differences in predicted probabilities of hypertension are wider at the lowest levels of wealth, while caste differences seem to be smaller at the highest levels of wealth. Additionally, higher levels of wealth seem to be more protective for the non-caste group than the upper caste as the non-caste group was statistically significantly different from the reference group upper caste. Other backward classes were also statistically significantly different than the reference group, and it suggests that wealth effect is not protective for other backward classes as it is for the upper caste. As shown in Fig. 2, while probabilities of

Table 1 Percentage distribution of sample characteristics ($n = 648,064$)

Variables	Upper caste ($n = 106,054$) (16.36%)	Scheduled caste ($n = 111,530$) (17.21%)	Scheduled tribe ($n = 68,408$) (10.56%)	Other backward classes ($n = 218,489$) (33.71%)	Non-caste ($n = 143,583$) (22.16%)	Total ($n = 648,064$)
Have hypertension	12.70	10.45	11.33	10.47	13.34	11.56
Average wealth score (SD)	0.66 (0.94)	− 0.15 (0.92)	− 0.66 (0.82)	0.07 (0.95)	0.12 (0.89)	0.06 (0.98)
Average years of education (SD)	9.15 (4.93)	5.78 (5.03)	4.64 (4.81)	6.72 (5.19)	6.47 (4.95)	6.68 (5.19)
Average age (SD)	30.84 (9.78)	29.44 (9.73)	29.58 (9.72)	29.93 (9.80)	29.39 (9.66)	29.84 (9.76)
Average BMI (SD)	22.73 (4.60)	21.25 (4.04)	20.37 (3.45)	21.55 (4.21)	22.19 (4.22)	21.71 (4.23)
Average random blood glucose (mg/dl) (SD)	105.31 (29.74)	103.29 (28.27)	102.61 (24.50)	103.68 (28.44)	105.26 (29.11)	104.12 (28.41)
Smokes cigarettes	0.07	0.08	0.13	0.06	1.30	0.35
Rural place of residence	62.18	75.17	88.57	72.82	63.45	71.07
Marital status						
Single	23.66	23.55	22.45	22.17	29.26	24.25
Married	72.67	72.36	72.79	74.12	66.39	71.73
Widowed	2.90	3.16	3.53	2.85	2.50	2.91
Divorced	0.24	0.27	0.36	0.25	1.06	0.44
Separated	0.53	0.67	0.88	0.60	0.79	0.67

Table 2 Logistic regression results of factors related to hypertension: Indian Family Health Survey 2015–16, ($n = 648{,}064$)

Variable	Model 1		Model 2		Model 3		Model 4	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Caste (RC = upper caste)								
Scheduled caste	1.00	0.96–1.05	0.96	0.92–1.01	0.86*	0.76–0.99	0.91**	0.85–0.97
Scheduled tribe	1.17***	1.11–1.24	1.11***	1.06–1.18	1.04	0.91–1.20	1.05	0.98–1.13
Other backward classes	0.96*	0.93–0.99	0.94***	0.90–0.97	0.77***	0.69–0.87	0.85***	0.80–0.90
Non-caste	1.19***	1.15–1.25	1.15***	1.10–1.21	1.31***	1.14–1.50	1.18***	1.10–1.26
Wealth scores			0.99	0.97–1.00	0.96*	0.93–0.99	0.99	0.97–1.00
Education (in years)			0.98***	0.99–0.99	0.99***	0.98–0.99	0.98***	0.98–0.99
Caste*wealth								
Scheduled caste					1.04	0.99–1.09		
Scheduled tribe					1.02	0.96–1.08		
Other backward classes					1.07**	1.03–1.11		
Non-caste					0.95*	0.91–0.99		
Caste*education								
Scheduled caste							1.01	0.99–1.02
Scheduled tribe							1.01	0.99–1.02
Other backward classes							1.01**	1.01–1.02
Non-caste							0.99	0.93–0.10

OR = odds ratio, *RC* = reference category

*$p < 0.05$

**$p < 0.01$

***$p < 0.001$

Model 1 controls for age, marital status, smoking status, glucose, BMI, and type of residence

Model 2 added wealth index and years of education to Model 1

hypertension tend to decline with increasing levels of education, the decline seems to be the steepest for the non-caste and upper caste members. It appears that higher education does not bring as much improvement in health to other backward classes as it does for the upper caste (the slope differences between two groups were statistically significant).

Discussion

This study examines the caste differences in hypertension in India using a nationally representative data set. Our analysis revealed population-level caste differences in the prevalence of hypertension and the extent to which two important SES indicators, education and wealth, condition the caste differences in hypertension among reproductive-aged women. The unique contribution of this study is highlighting caste membership, as an important factor for social stratification in health, which also intersects in complex ways with SES in patterning the population-level disparities in hypertension in India.

We find that scheduled tribes and non-caste groups have a higher likelihood of hypertension compared with the upper caste group. Our findings also concur with recent studies that have shown that the disadvantaged caste groups such as scheduled tribes have higher levels of hypertension compared with the upper caste members [43, 54–56]. This can plausibly be explained by the fact that women of scheduled tribes constitute one of the most visible underprivileged groups in India. Tribal people have historically been exposed to greater inequality and discrimination in terms of access to resources that can improve their social status [57]. Given the historical exclusion from social and economic opportunities, tribal women tend to have lower levels of educational attainment, labor market opportunities, and social mobility. Because of these structural factors, tribal women may have greater exposure to psychosocial stressors associated with their socioeconomically disadvantaged position. Psychosocial stressors are known to be associated with the development of chronic conditions such as hypertension through the processes of stress-related dysregulation [58, 59].

Findings from additive regression models also indicate that non-caste members have a higher likelihood of hypertension than upper caste members. It is worth noting that the caste system does not apply to non-Hindu populations and religious minority groups in India. It is not surprising to find that

although non-caste members have no affiliation with the caste system, they report higher levels of hypertension in India. Religious minorities often experience covert and overt forms of discrimination, stigma, and socio-political marginalization in India [60, 61] . Discrimination and feelings of marginalization and insecurity are well-known risk factors for hypertension [62–64].

The indicators of SES were inversely associated with hypertension. However, the analysis found substantial heterogeneity in the associations of SES indicators with hypertension. We observed two distinct findings. First, the SES patterning of hypertension was not invariant by caste groups. For instance, as shown in the predicted probability graphs, compared with upper caste members, the SES–hypertension association was weaker in other backward class women and more protective in non-caste women. Second, caste difference in risk of hypertension was larger at the lower levels of SES, with clearer pattern apparent in wealth index, and caste difference became smaller at the higher levels of SES.

Our findings demonstrated that the protective effect of SES is not homogenous across caste groups. The evidence of diminishing returns to SES in other backward caste women concurs with studies of differential social patterning by racial groups in the USA. Studies demonstrated that African Americans do not gain the same return to SES when it comes to the question of health [19, 20, 22]. The diminishing returns to education and wealth for disadvantaged caste members, such as other backward classes, can be attributed to the pervasive caste-based discrimination and social exclusion. Additionally, we note that higher SES disadvantaged caste groups may still live in underprivileged neighborhoods and face discrimination and social stigma. Studies report that neighborhood disadvantages attenuate the individual SES disparities in health [65]. Moreover, despite achieving vertical social mobility, disadvantaged caste women are still stigmatized and discriminated against for their enduring ascribed caste status.

Limitations

We acknowledge several limitations in this study. First, the Indian Family Health Survey primarily focuses on maternal, reproductive, and child health, and thus, survey subjects were restricted to 15–49 years old. Although the hypertension prevalence is increasingly becoming common among young adults, the development of hypertension picks at later ages. The associations of caste groups with hypertension and heterogeneity in the effects of SES factors could have been more robust if we had a relatively older age cohort in the sample. Second, the current study focuses solely on women, preventing us from making significant gender comparisons. Future studies may look at whether measures of SES may function differently for women and men and whether gender and caste intersect in predicting hypertension. Given the patriarchal nature that has culturally and historically dominated in India, it would be worth analyzing how the SES inequalities in health differ by gender. Third, our analysis uses a cross-sectional survey, and therefore, it offers only a snapshot in time for the variables in question. Future research should employ longitudinal methods to account for change in wealth over time (accumulation or attrition), and how such changes affect fluctuation, if any, in hypertension rates.

Conclusion

Our findings point to the fact that there is a clear SES patterning in hypertension and that substantial variation exists in the strength and protective directions of SES indicators by caste groups. Understanding these variations by caste groups in general, and what it is about caste membership that affects hypertension, in particular, will help clarify the caste disparities in health. Caste membership acts as both the foundation and the boundaries by which ascribed status is set and achieved status is bound. This social system hinders upward mobility, educational attainment, and wealth accumulation. As a result, future research must consider the saliency of caste membership as an ascribed status that limits social mobility and affects different outcomes across the life course.

Compliance with Ethical Standards

Conflict of Interest The authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

References

1. Kearney PM, Whelton M, Reynolds K, Muntner P, Whelton PK, He J. Global burden of hypertension: analysis of worldwide data. Lancet. 2005;365(9455):217–23.
2. Rahman M, Williams G, Al Mamun A. Hypertension and diabetes prevalence among adults with moderately increased BMI (23· 0–24· 9 kg/m 2): findings from a nationwide survey in Bangladesh. Public Health Nutr. 2017;20(8):1343–50.
3. Verdecchia P, et al. Different prognostic impact of 24-hour mean blood pressure and pulse pressure on stroke and coronary artery disease in essential hypertension. Circulation. 2001;103(21):2579–84.

4. Hedner T, Kjeldsen SE, Narkiewicz K. State of global health–hypertension burden and control. Blood Pressure. 2012;21(sup1): 1–2.
5. Geldsetzer P, Manne-Goehler J, Theilmann M, Davies JI, Awasthi A, Vollmer S, et al. Diabetes and hypertension in India: a nationally representative study of 1.3 million adults. JAMA Intern Med. 2018;178(3):363–72.
6. Venkateshmurthy NS, Geldsetzer P, Jaacks LM, Prabhakaran D. Implications of the new American College of Cardiology Guidelines for hypertension prevalence in India. JAMA Intern Med. 2018;178(10):1416–8.
7. Zhou B, et al. Worldwide trends in blood pressure from 1975 to 2015: a pooled analysis of 1479 population-based measurement studies with 19·1 million participants. Lancet. 2017;389(10064): 37–55.
8. Desai S, Dubey A. Caste in 21st century India: competing narratives. Econ Polit Wkly. 2012;46(11):40–9.
9. Vaid D. Caste in contemporary India: flexibility and persistence. Annu Rev Sociol. 2014;40:391–410.
10. Beteille A, Caste C. Power: Changing Patterns of Stratification in a Tanjore Village. Berkeley. 1965 BeteilleCaste, Class and Power: Changing Patterns of Stratification in a Tanjore Village 1965: University of California Press; 1965.
11. Dumont L. Homo hierarchicus: The caste system and its implications. Chicago: University of Chicago Press; 1980.
12. Bayly S. Caste, society and politics in India from the eighteenth century to the modern age. Cambridge: Cambridge University Press; 2001.
13. Subramanian S, et al. Health inequalities in India: the axes of stratification. Brown J World Affairs. 2008;14(2):127–38.
14. Subramanian S, Nandy S, Irving M, Gordon D, Lambert H, Davey Smith G. The mortality divide in India: the differential contributions of gender, caste, and standard of living across the life course. Am J Public Health. 2006;96(5):818–25.
15. Dommaraju P, Agadjanian V, Yabiku S. The pervasive and persistent influence of caste on child mortality in India. Popul Res Policy Rev. 2008;27(4):477–95.
16. Bora JK, Raushan R, Lutz W. Contribution of education to infant and under-five mortality disparities among caste groups in India, Working Papers, Vienna Institute of Demography. 2018. Retrieved from: http://pure.iiasa.ac.at/id/eprint/15173/1/WP2018_03.pdf. Accessed 1 Feb 2019
17. Link BG, Phelan J. Social conditions as fundamental causes of disease. J Health Soc Behav. 1995;Spec No:80–94.
18. Phelan JC, Link BG, Tehranifar P. Social conditions as fundamental causes of health inequalities: theory, evidence, and policy implications. J Health Soc Behav. 2010;51(Suppl):S28–40.
19. Farmer MM, Ferraro KF. Are racial disparities in health conditional on socioeconomic status? Soc Sci Med. 2005;60(1):191–204.
20. Assari S. Blacks' diminished return of education attainment on subjective health; mediating effect of income. Brain Sci. 2018;8(9):176.
21. Assari S. Health disparities due to diminished return among black Americans: public policy solutions. Soc Issues Policy Rev. 2018;12(1):112–45.
22. Assari S, Thomas A, Caldwell CH, Mincy RB. Blacks' diminished health return of family structure and socioeconomic status; 15 years of follow-up of a national urban sample of youth. J Urban Health. 2018;95(1):21–35.
23. Williams DR, Collins C. Racial residential segregation: a fundamental cause of racial disparities in health. Public Health Rep. 2001;116(Sep-Oct):404–16.
24. Pager D, Shepherd H. The sociology of discrimination: racial discrimination in employment, housing, credit, and consumer markets. Annu Rev Sociol. 2008;34:181–209.
25. Acharya SS. Health equity in India: an examination through the Lens of social exclusion. J Soc Inclusion Stud. 2018;4(1):104–30.
26. Deshpande A. Does caste still define disparity? A look at inequality in Kerala, India. Am Econ Rev. 2000;90(2):322–5.
27. Deshpande A. The grammar of caste: economic discrimination in contemporary India. Oxford: Oxford University Press; 2011.
28. Bapuji H, Chrispal S. Understanding economic inequality through the lens of caste. J Bus Ethics. 2018;(August):1–19.
29. Madheswaran S, Singhari S. Social exclusion and caste discrimination in public and private sectors in India: a decomposition analysis. Indian J Labour Econ. 2017;59(2):175–201.
30. Deshpande R, Palshikar S. Occupational mobility: How much does caste matter? Econ Polit Wkly. 2008;43(34):61–70.
31. Vaid D., Heath, A. Unequal opportunities: class, caste and social mobility. In: Anthony F. Health and Roger Jeffery, editors. Diversity and change in modern India. Oxford: Oxford University Press; 2010. p. 129–64.
32. Vaid D. The caste-class association in India: an empirical analysis. Asian Surv. 2012;52(2):395–422.
33. Vithayathil T, Singh G. Spaces of discrimination: residential segregation in Indian cities. Econ Polit Wkly. 2012;47(37):60–6.
34. Bharathi N, Malghan DV, Rahman A. Isolated by caste: neighbourhood-scale residential segregation in Indian metros. IIM Bangalore Research Paper No. 572. 2018;572:1–22.
35. Beteille A. Caste in contemporary India. In: Fuller C, editor. Caste Today. New Delhi, India: Oxford University Press; 1996. p. 150–77.
36. Desai S, Kulkarni V. Changing educational inequalities in India in the context of affirmative action. Demography. 2008;45(2):245–70.
37. Cassan G. Affirmative action, education and gender: evidence from India. J Dev Econ. 2019;136:51–70.
38. Crenshaw K. Demarginalizing the intersection of race and sex: a black feminist critique of antidiscrimination doctrine, feminist theory and antiracist politics: Un. Chi. Legal Forum. 1989;issue 1: 139–67.
39. Crenshaw K. Mapping the margins: Intersectionality, identity politics, and violence against women of color. Stan L Rev. 1990;43: 1241.
40. Perry BL, Harp KL, Oser CB. Racial and gender discrimination in the stress process: implications for African American women's health and well-being. Sociol Perspect. 2013;56(1):25–48.
41. Subramanian SV, Davey Smith G, Subramanyam M. Indigenous health and socioeconomic status in India. PLoS Med. 2006;3(10): e421.
42. Corsi DJ, Subramanian SV. Association between socioeconomic status and self-reported diabetes in India: a cross-sectional multilevel analysis. BMJ Open. 2012;2(4):e000895. https://doi.org/10.1136/bmjopen-2012-000895.
43. Corsi DJ, Subramanian SV. Socioeconomic gradients and distribution of diabetes, hypertension, and obesity in India. JAMA Netw Open. 2019;2(4):e190411.
44. Mohindra KS, Haddad S, Narayana D. Women's health in a rural community in Kerala, India: do caste and socioeconomic position matter? J Epidemiol Community Health. 2006;60(12):1020–6.
45. Garrett DA, Sangha JK, Kothari MT, Boyle D. Field-friendly techniques for assessment of biomarkers of nutrition for development. Am J Clin Nutr. 2011;94(2):685S–90S.
46. Whelton PK, Carey RM, Aronow WS, Casey de Jr, Collins KJ, Dennison Himmelfarb C, et al. 2017 ACC/AHA/AAPA/ABC/ACPM/AGS/APhA/ASH/ASPC/NMA/PCNA guideline for the prevention, detection, evaluation, and Management of High Blood Pressure in adults: executive summary: a report of the American College of Cardiology/American Heart Association task force on clinical practice guidelines. Hypertension. 2018;71(6):1269–324.
47. IIPS I. National family health survey (NFHS-4), 2015–16: India. Mumbai: International Institute for Population Sciences; 2017.

48. Planning Commission. Working group report of the development of education of SC/ST/Minorities/Girls and other disadvantaged groups for 11th five year plan (2007–2012). 2007. Retrieved from https://planipolis.iiep.unesco.org/sites/planipolis/files/ressources/india_wg11_scst.pdf. Accessed 10 Aug 2019
49. Deshpande, A. and Weisskopf, T.E. Does affirmative action reduce productivity? A case study of the Indian railways. World Development, 2014; 64:169–180
50. Filmer D, Pritchett LH. Estimating wealth effects without expenditure data—or tears: an application to educational enrollments in states of India. Demography. 2001;38(1):115–32.
51. Rutstein SO, Johnson K. The DHS wealth index. DHS comparative reports no. 6. Calverton: ORC Macro; 2004.
52. Wong KL, Restrepo-Méndez MC, Barros AJ, Victora CG. Socioeconomic inequalities in skilled birth attendance and child stunting in selected low and middle income countries: Wealth quintiles or deciles? PLoS One. 2017;12(5):e0174823. https://doi.org/10.1371/journal.pone.0174823.
53. del Pilar Flores-Quispe M, et al. Trends in socioeconomic inequalities in stunting prevalence in Latin America and the Caribbean countries: differences between quintiles and deciles. Int J Equity Health. 2019;18(1):156.
54. Chakma T, Kavishwar A, Sharma RK, Rao PV. High prevalence of hypertension and its selected risk factors among adult tribal population in Central India. Pathogens Global Health. 2017;111(7):343–50.
55. Deo M, Pawar PV, Kanetkar SR, Kakade SV. Multicentric study on prevalence and risk factors for hypertension and diabetes in tribal communities in Western and Northern Maharashtra. J Postgrad Med. 2018;64(1):23–34.
56. Bhise MD, Patra S. Prevalence and correlates of hypertension in Maharashtra, India: a multilevel analysis. PLoS One. 2018;13(2):e0191948.
57. Sonowal C. Indian tribes and issue of social inclusion and exclusion. Stud Tribes Tribals. 2008;6(2):123–34.
58. McEwen BS, Gianaros PJ. Central role of the brain in stress and adaptation: links to socioeconomic status, health, and disease. Ann N Y Acad Sci. 2010;1186:190.
59. Spruill TM. Chronic psychosocial stress and hypertension. Curr Hypertens Rep. 2010;12(1):10–6.
60. Kumar M. Politics of exclusion and social marginalization of Muslims in India: case study of Gujarat. Int J Appl Psychoanal Stud. 2010;7(3):209–18.
61. Shaban A. Lives of Muslims in India: politics, exclusion and violence. Abingdon: Taylor & Francis; 2018.
62. Sims M, et al. Perceived discrimination and hypertension among African Americans in the Jackson Heart Study. Am J Public Health. 2012;102(S2):S258–65.
63. Cuffee YL, Hargraves JL, Allison J. Exploring the association between reported discrimination and hypertension among African Americans: a systematic review. Ethn Dis. 2012;22(4):422–32.
64. Williams DR, Mohammed SA. Discrimination and racial disparities in health: evidence and needed research. J Behav Med. 2009;32(1):20–47.
65. Yao L, Robert SA. Examining the racial crossover in mortality between African American and white older adults: a multilevel survival analysis of race, individual socioeconomic status, and neighborhood socioeconomic context. J Aging Res. 2011;2011:1–8.