LONDON
SCHOOL *of*
HYGIENE
&TROPICAL
MEDICINE

BMJ Open

Epidemiological features of alcohol use in rural India: a population-based cross-sectional study

Sujit D Rathod,[1] Abhijit Nadkarni,[2] Arvin Bhana,[3] Rahul Shidhaye[4]

[1]Department of Population Health, London School of Hygiene and Tropical Medicine, London, UK
[2]Sangath, Goa, India
[3]School of Applied Human Sciences, University of KwaZulu-Natal, Durban, South Africa
[4]Centre for Mental Health, Public Health Foundation of India, New Delhi, India

Correspondence to
Dr Sujit D Rathod;
Sujit.rathod@lshtm.ac.uk

ABSTRACT

Objectives: We sought to estimate the proportion of adults in Sehore District, India, who consumed alcohol, and the proportion who had behaviours consistent with alcohol use disorders (AUDs), using the Alcohol Use Disorders Identification Test (AUDIT). Among men who drank, we identified individual-level, household-level and community-level factors associated with AUDIT scores. Men with AUDs (AUDIT score ≥8) reported on whether and where they had sought treatment, and about alcohol-related internal stigma.

Design: Population-based cross-sectional study.

Setting: Rural villages and urban wards in Sehore District, Madhya Pradesh, India.

Participants: n=3220 adult (≥18 years of age) residents of Sehore District.

Primary outcome measure: Score on the AUDIT.

Results: Nearly one in four men (23.8%) had consumed alcohol in the past 12 months, while few (0.6%) women were consumers. Among drinkers, 33.2% (95% CI 28.6% to 38.1%) had AUDIT scores consistent with hazardous drinking, 3.3% (95% CI 2.1% to 5.1%) with harmful drinking and 5.5% (95% CI 3.8% to 8.0%) with dependent drinking. We observed that AUDIT scores varied widely by village (intraclass correlation=0.052). Among men who had recently consumed alcohol, AUDIT scores were positively associated with depression, having at least one child, high-quality housing, urban residence, tobacco use and disability. AUDIT scores were negatively associated with land ownership, out-of-pocket healthcare expenditure and participation in the national employment programme. While 49.2% of men with AUDs felt embarrassed by their problems with alcohol, only 2.8% had sought treatment in the past 12 months.

Conclusions: A need exists for effectively identifying and treating adults with AUDs. Health promotion services, informed by commonly-expressed stigmatised beliefs held among those affected by AUDs and which are targeted at the most affected communities, may be an effective step in closing the treatment gap.

BACKGROUND

Alcohol misuse is a major and increasingly attributable risk factor for morbidity and mortality worldwide.[1–3] Studies of communities in India show that while the prevalence of alcohol abstention is relatively high, those who do drink are highly likely to engage in hazardous, harmful or dependent drinking behaviours,[4–8] here collectively referred to as alcohol use disorders (AUDs) (International Classification of Diseases 10th Edition, ICD-10: Z72.1, F10.1, F10.2).[9]

While the impact of AUDs is direct (ie, through overdose or fetal alcohol syndrome), studies conducted in India demonstrate that much of the impact is mediated through increased risk of accidents, development or progression of chronic disease and acquisition of infection.[10–14] Further, individuals affected by AUDs have broader social impacts through the increased risk of violence and the health and economic consequences of consumption or injury.[5 13 15–19] AUDs have consistently been identified as a public health concern over the past 20 years,[20–23] during which time per capita consumption of alcohol has increased by 55%,[24] and the treatment gap for those affected has remained persistently high.[18 25 26]

The effects of AUDs have motivated the development of programmes such as Screening and Brief Intervention, which aim to reduce the frequency and intensity of alcohol consumption episodes. Screening and Brief Intervention has been shown to be

Strengths and limitations of this study

- This is the first population-based survey of alcohol use to be conducted in Madhya Pradesh, India in 10 years, and one of the few studies of alcohol use in India to include women.
- We used a widely validated screening tool (AUDIT) to identify participants who had alcohol use disorders.
- Since this is a cross-sectional study, we are unable to determine whether any of the factors associated with AUDIT scores are causal relationships.

effective and cost-effective in low-income settings,[27] [28] where access to treatment services remains limited.[29] The treatment gap in India has not been well characterised, nor have the characteristics of those individuals who need services. As a prerequisite to the adaptation and implementation of Screening and Brief Intervention, we conducted a study to describe the epidemiological features of alcohol consumption and of treatment-seeking among adults living in a rural district in India.

METHODS

Setting

Sehore District is a predominantly rural district in central India, with a population of 1.3 million people. At the time of this study, inpatient detoxification and rehabilitation services were available in Sehore city at a government-funded 15-bed facility. Additional detoxification and rehabilitation services were available in the public and private sectors in Bhopal city, approximately 34 km away from Sehore city. As part of the PRIME research programme consortium and in partnership with the Madhya Pradesh State Ministry of Health, Sehore District was selected to implement a district-level mental healthcare plan to integrate mental health diagnostic and treatment services into the primary healthcare sector.[30] The primary aim of the PRIME Community Surveys is to detect a change in treatment-seeking among adults with alcohol use or depressive disorders. We conducted a baseline round of data collection immediately prior to implementation of the district-level mental health plan, and plan to conduct a follow-up round of data collection 18 months later.

Sample and questionnaire

In Sehore, a sample size of 3220 in each survey round provides over 80% power to detect a change in treatment-seeking among adults with AUDs from 5% to 20% with a two-sided α of 0.05. We assumed that approximately 10% of adults would have AUDs. Since we planned to use a cluster sampling design, we used a conservative value of 0.10 for the intraclass correlation for treatment-seeking. We used 2011 census data[31] to recruit this population-based sample as follows: In proportion to the population distribution in the district, we selected 70 villages from the rural stratum and 19 wards from the urban stratum. Within each selected village/ward, we used simple random sampling to select one electoral polling station's voter list.[32] Within the selected list, we randomly selected between 25 and 47 adults, with the variation in allocation being a function of the research assistants' time availability. The research assistant located the adult's household and contacted the adult, scheduled a return visit through another household member (if the selected adult was not present) or moved to the next adult of the same sex on the voting list (if the originally selected adult no longer resided at that address). On meeting the selected adult,

the research assistant explained the aims of the study, assessed the adult for eligibility (ie, age≥18 years, fluent in Hindi and absence of intellectual impairment or acute medical issue) and scheduled eligible adults for an interview. The interviewers were male and female university graduates who were mostly residents of Sehore District. The interviewers orally administered a structured interview in Hindi, using a questionnaire application[33] programmed on a tablet device.

The questionnaire consisted of sections pertaining to: sociodemographic characteristics; recent use of alcohol or tobacco; screening for alcohol use disorders; treatment-seeking and stigma for problems with alcohol; screening for depression; treatment-seeking and stigma for depression; suicidality; healthcare usage and out-of-pocket expenditures; and disability severity.

Health-related measures

The outcome measure of interest is the total score on the 10-item AUDIT.[34] The AUDIT was developed by WHO and has been widely validated, including in India.[35] [36] Respondents are asked about the frequency of different drinking behaviours and consequences over the past 12 months, and their responses are scored from 0 (Never occurs) to 4 (Daily). The sum of scores from the 10 items provides guidance on whether the respondent engages in hazardous (score 8–15), harmful (score 16–19) or dependent (score ≥20) drinking behaviours, using cut-offs defined by WHO.[34] Participants who had not consumed alcohol in the past 12 months were not administered the AUDIT and were allocated a score of 0. Participants who had an AUDIT score of 8 or more were asked about their treatment-seeking, and then were asked 11 questions from the 29-item Internalized Stigma of Mental Illness scale[37] with regard to 'problems with drinking'; these 11 items were selected for the questionnaire as they were relevant to the cultural and programmatic contexts across PRIME countries.

To measure depression severity, we administered the 9-item Patient's Health Questionnaire (PHQ-9)[38]— which has been validated in India[39] [40]—followed by a question on suicidal ideation which was adapted from the Mini International Neuropsychiatric Interview (MINI), a diagnostic tool for mental disorders.[41] To measure disability, we administered the 12-item WHO Disability Assessment Schedule 2.0 (WHODAS),[42] which has been widely validated for use in low income and middle income country settings. Using questions adapted from the Client Service Receipt Inventory,[43] we asked participants whether they had any inpatient admissions to a hospital in the past 12 months, whether they had used any outpatient health services in the past 3 months, as well as out-of-pocket expenses for those outpatient services.

Sociodemographic measures

The items included in the sociodemographic section were adapted from the Indian version of the

Demographic and Health Surveys.[44] Participants were asked how many years of education they had completed, and from these responses we created categories for educational attainment (0 years, 1–5 years, 6–11 years, and ≥12 years). As a proxy for socioeconomic status, we asked participants about whether they owned any land, as well as about the quality of their home construction; we used Government of India definitions to classify the homes into those with lower, average and higher quality.[45] Participants were engaged in a wide range of occupations, and from these responses we adapted an occupation classification system[46] to create four groups reflecting no occupation, non-income work (eg, household work, student), lower income work (eg, agriculture, unskilled manual) and higher income work (eg, teacher, police/military, skilled manual), as well as whether they had signed up to receive work assignments through a national employment programme.

Statistical methods

First, we described the sociodemographic characteristics and AUDIT scores of the full sample of 3220 adults and reported the distribution of the sample within each measurement stratum (eg, age group, education group). Then within each sociodemographic stratum, we reported the percentages of adults who had and had not consumed alcohol in the past 12 months. Among all participants and then among men, women and those who had recently consumed alcohol, we report the mean AUDIT score and the proportions who have AUDIT scores consistent with hazardous, harmful and dependent drinking. Next, using data from adults who had recently consumed alcohol, we estimated the

Figure 1 Participant flow diagram for PRIME Community Survey, Sehore District, India, 2013–2014. AUDs, alcohol use disorders

internal consistency of the AUDIT score using Cronbach's α, and using data from all adults we estimated the intraclass correlation for clustering of AUDIT scores by ward/village using large one-way analysis of variance.

Previous research conducted in India has demonstrated that alcohol consumption is almost universally a male activity. Thus, we restricted the next analysis of the sample to male participants who reported consuming alcohol in the past 12 months. With these participants, we used univariable zero-truncated negative binomial regression models to assess individual-level, household-level and community-level characteristics, inpatient care, outpatient out-of-pocket expenditure, tobacco use and depression and disability severity for their association with the AUDIT score. The negative binomial regression model is suitable for skewed outcome data, and produces coefficients which—once exponentiated—are interpreted as the relative difference in the AUDIT score for every unit change in the independent variable. We have analysed the AUDIT score as a continuous score rather than a binary category as we are interested in risk factors associated with increasing harm from alcohol, which can inform development of population-level strategies to reduce those risks. In contrast, analysis of a binary category would be more suitable to inform clinical care, where only high-scoring individuals would receive referral for treatment. For each regression model, we report the exponentiated β coefficients and their 95% CIs. We combined strata when one stratum comprised less than 0.1% of the population of male drinkers (eg, 'No caste' combined with 'general caste').

Finally, we further restricted the sample to participants who had AUDIT scores of 8 or more. We describe the treatment-seeking behaviour, if any, of these participants and tabulated the frequency of affirmative response to questions about internalised stigma beliefs (figure 1).

We completed all analyses in Stata/IC 13.1 (College Station, USA), and adjusted all mean, percentage and regression coefficient figures for the complex sampling design. (see online supplementary material).

Ethics

Interviewers gave eligible adults oral and written information about the study and consenting adults provided a signature (or thumb print for low-literacy adults). For adults who expressed suicidal ideation during the interview process, the interviewer provided a referral to a research psychiatrist.

RESULTS

We conducted the survey in two waves (May–June 2013 and January–March 2014), during which time we selected 5170 adults from voting lists for recruitment, of whom we were able to contact 3233. Of the 3233 adults we were able to contact, 3220 provided informed
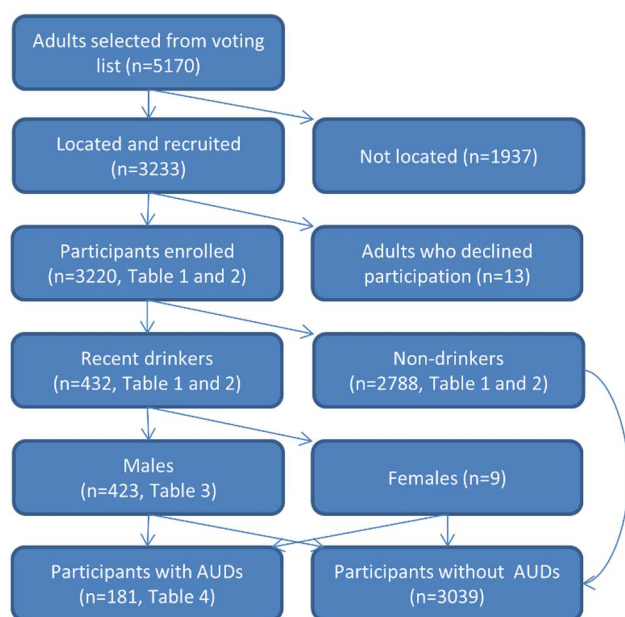
consent (survey response rate=99.6%). Consistent with the overall population distribution of Sehore District, most of the 3220 participants (78%) were recruited from the rural stratum and the remainder (22%) from the urban stratum. The sociodemographic characteristics of the sample are described in table 1. The mean age of the adults was 40.2 years (SD 15.1) and 55% were male. Most adults were Hindu (90%), currently married (85%) and had at least one child (94%). Educational attainment was low, as 28% of adults never attended school and another 23% started but did not complete primary school (23%). Few participants (9%) had a higher income occupation.

Across the entire population, 13.3% of adults (95% CI 11.6% to 15.2%) had consumed alcohol at least once in the past year; the sociodemographic stratum-specific prevalences of alcohol consumption are presented in table 1. Alcohol consumption varied widely between sociodemographic groups: while 23.8% of men and 14.7% of Hindus had consumed alcohol in the past 12 months, only 0.6% of women and 1.2% of Muslims did. Among those who had recently consumed alcohol, the internal consistency of the AUDIT screening tool was high (Cronbach's α=0.783). The intraclass correlation for AUDIT scores was 0.052: though the mean AUDIT score for males across Sehore District was 1.0, the cluster-specific means (for individual villages or wards) ranged from 0.00 to 5.3 (figure 2). The alcohol consumption patterns for women, men and currently drinkers are presented in table 2. Recent consumption of alcohol was acknowledged by a minority of women (0.6%) and men (23.8%), and the mean AUDIT scores for these groups were 0.03 and 1.8, respectively. Among those who had recently consumed alcohol, the mean AUDIT score was 7.5; 33.2% of these individuals had an AUDIT score which was consistent with hazardous alcohol consumption behaviour (AUDIT score 8–15), 3.3% with harmful behaviour (AUDIT score 16–19) and 5.5% with dependent behaviour (AUDIT score ≥20).

The correlates of AUDIT scores among male drinkers are described in table 3. AUDIT scores were 65% lower for drinkers who were widowed, divorced, separated or deserted (relative score=0.35, 95% CI 0.17 to 0.72) relative to those who were married. For each unit increase in PHQ9 score, the AUDIT score was 5% higher (relative score=1.05, 95% CI 1.03 to 1.07). Having at least one child, high-quality housing, urban residence, suicidal ideation, tobacco use and disability were all positively associated with AUDIT scores, whereas land ownership, out-of-pocket healthcare expenditure and participation in the national employment programme were negatively associated with AUDIT scores. We did not find evidence of differences in AUDIT scores by religion, caste, occupation type or use of inpatient care.

Of the adults with AUD, only 2.8% had sought treatment for problems with drinking in the past 12 months, primarily from traditional healers. Nearly one in four (23.9%) adults with AUDs spoke to another person about their drinking, primarily to a spouse/partner or a friend.

The internalised stigma beliefs of adults with AUDs are presented in table 4. Nearly half of these adults felt

Table 1 Characteristics of adults in Sehore District, India, 2013–2014

Characteristic		Current drinker	
		Per cent	Per cent
Category	Proportion of total (%)	No	Yes
Age (years)			
18–29	27.6	84.2	15.8
30–49	47.0	87.2	12.8
≥50	25.4	88.4	11.6
Sex			
Female	45.4	99.4	0.6
Male	54.6	76.2	23.8
Religion			
Hindu	89.8	85.3	14.7
Muslim	10.2	98.8	1.2
Other	<0.1		
Caste			
General	13.1	91.4	8.6
Scheduled caste	19.7	77.0	23.0
Scheduled tribe	5.1	69.6	30.4
Other backward caste	62.1	90.2	9.8
None	<0.1		
Marital status			
Currently married	84.6	86.3	13.7
Unmarried	10.5	85.7	14.3
Widow(er)	4.4	97.6	2.4
Divorced, separated, deserted	0.5	84.0	16.0
Children*			
0	5.9	80.8	19.2
≥1	94.1	87.2	12.8
Educational attainment (years)			
0	28.1	92.2	7.8
1–5	22.8	86.3	13.7
6–11	36.5	83.0	17.0
≥12	12.6	85.8	14.2
Housing quality			
Lower	43.6	84.3	15.7
Average	26.2	89.2	10.8
Higher	30.1	87.9	12.1
Owns land			
No	73.0	87.5	12.5
Yes	27.0	84.5	15.5
Occupation type			
None	4.1	81.7	18.3
Non-income	33.6	98.4	1.6
Lower income	53.0	81.1	18.9
Higher income	9.3	78.4	21.6
Working in employment programme			
No	92.5	87.2	12.8
Yes	7.5	80.6	19.4

Percentage figures are adjusted for the complex sampling design.
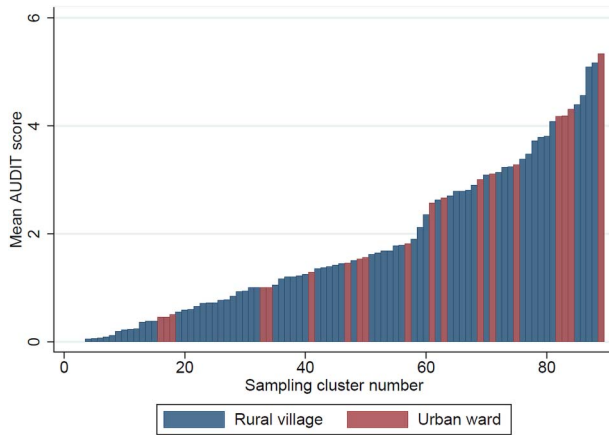*Among ever married respondents.

Figure 2 Distribution of mean AUDIT score for male residents of selected villages and wards in Sehore District, India, 2013-2014. AUDIT, Alcohol Use Disorders Identification Test.

embarrassment or shame (49.2%) or disappointment in themselves (47.2%) because of problems with drinking. A few of these adults reported that they were unable to make their own decisions (20.3%) or that they were ignored (16.6%) because of their problems with alcohol.

DISCUSSION

In Sehore District, we found that a minority (13.3%) of adults consumed alcohol in the past 1 year, though a substantial proportion (42%) of the adults who did consume alcohol had behaviours consistent with alcohol use disorders. AUDIT scores were positively associated educational attainment, urban residence, having children, high-quality housing, depression severity, disability severity and usage of tobacco products. Adults who had AUDs were unlikely to have sought treatment from a medical provider, were likely to feel personal shame, but were not likely to feel social stigma.

The PRIME Community Survey is notable for being a large, population-based survey of alcohol use in Sehore District, and this is the first such study to be conducted in Madhya Pradesh State in 10 years. That prior study only considered whether respondents consumed alcohol or not and combined data across multiple states in

India. These data advance understanding by measuring the intensity of alcohol use, and in a single, defined population. We measured alcohol use with the AUDIT tool, which had been validated elsewhere in India,[35][36] and demonstrated here a high value for internal consistency.

The drinking population in Sehore District comprised a small proportion of men from the general population, within which a large proportion engages in hazardous, harmful or dependent drinking behaviours (table 2). These findings are consistent with the two other alcohol surveys conducted in Madhya Pradesh state[47][48] as well as elsewhere in India[7][25][49]). Multiround cross-sectional studies such as the PRIME Community Surveys are required to evaluate whether the prevalence of drinkers is increasing, particularly among women and whether those who do drink are increasing their consumption intensity. An understanding of these trends will help guide the health promotion messaging for the targeted population, and further support expansion of programmes for screening and brief intervention, and more intensive programmatic interventions.

In this study, the clustering coefficient for the AUDIT score provides evidence of a geographic component to drinking behaviours, such that a portion of an individual's AUDIT score is explained by the scores of other drinkers within the same village/ward. Evidence of geographic clustering was also present in the findings from a study of health facility attendees in Goa, India.[5] Further, a multistate survey of alcohol use in India, which included Madhya Pradesh state, found that 11% of the variance in drinking was explained by that individual's area of residence.[47] Additionally, an explanatory models study in Goa identified a person's peers as a key influence on alcohol use disorders.[50] The policy implication of these findings is that a community-level focus for health promotion programmes (eg, working with local non-governmental organisations and village health workers) may be necessary and conducted in addition to population-level programmes (eg, through legislation or taxation) in changing alcohol consumption patterns.

Recent consumption of alcohol was far higher among Hindus (14.7%) than Muslims (1.2%), a finding which is consistent with national patterns.[47] In contrast to a generally understood prohibition on alcohol

Table 2 Alcohol consumption among adults in Sehore District, India, 2013–2014

	All adults (95% CI)	Women (95% CI)	Men (95% CI)	Recent drinkers (95% CI)
AUDIT score, mean	1.0 (0.8 to 1.2)	0.03 (0.0 to 0.1)	1.8 (1.5 to 2.1)	7.5 (6.9 to 8.0)
Recent drinker, %	13.3 (11.6 to 15.2)	0.6 (0.3 to 1.1)	23.8 (20.8 to 27.1)	100.0
Hazardous drinking, %	4.4 (3.6 to 5.4)	0.1 (0.0 to 0.5)	8.0 (6.5 to 9.8)	33.2 (28.6 to 38.1)
Harmful drinking, %	0.4 (0.3 to 0.7)	0.0	0.7 (0.4 to 1.3)	3.3 (2.1 to 5.1)
Dependent drinking, %	0.7 (0.5 to 1.1)	0.0	1.3 (0.8 to 2.0)	5.5 (3.8 to 8.0)

'Recent drinkers' reported consumption of alcohol in the past 12 months.
Percentage figures and 95% CIs are adjusted for the complex sampling design.
AUDIT, Alcohol Use Disorders Identification Test.

Table 3 Sociodemographic and health-related correlates of AUDIT scores among adult males who recently drank alcohol in Sehore District, India, 2013–2014

	Relative score	95% CI
Age (per 10 years)	0.94*	0.87 to 1.01
Caste		
General/none	Ref.	
Other backward caste	0.99	0.72 to 1.35
Scheduled tribe/caste	0.89	0.66 to 1.21
Religion		
Muslim/other	Ref.	
Hindu	0.69	0.35 to 1.36
Education (years)		
0	Ref.	
1–5	1.43*	0.98 to 2.09
6–11	1.40*	0.97 to 2.01
≥12	1.15	0.78 to 1.69
Marital status		
Currently married	Ref.	
Unmarried	0.93	0.71 to 1.21
Widowed/ divorced/separated/ deserted	0.35**	0.17 to 0.72
Children†		
0		
≥1	1.32*	0.97 to 1.80
Occupation type		
None	1.06	0.54 to 2.07
Non-income	Ref.	
Lower income	1.31	0.80 to 2.16
Higher income	1.07	0.61 to 1.87
Working in employment programme		
No	Ref.	
Yes	0.66**	0.48 to 0.90
Owns land		
No	Ref.	
Yes	0.82**	0.68 to 0.98
Housing quality		
Lower	Ref.	
Average	1.11	0.88 to 1.40
Higher	1.26**	1.03 to 1.54
Residential stratum		
Rural	Ref.	
Urban	1.19**	1.01 to 1.39
Currently uses tobacco products		
No	Ref.	
Yes	1.50**	1.09 to 2.07
Depression severity (PHQ9 score)	1.05**	1.03 to 1.07
Suicidal ideation		
No	Ref.	
Yes	1.29*	0.96 to 1.74
Inpatient care		
No	Ref.	
Yes	1.04	0.76 to 1.41
Outpatient care expenditure (per US$100‡)	0.72**	0.53 to 0.99
Disability severity (WHODAS score)	1.03**	1.01 to 1.05

Relative score and 95% CIs are estimated with zero truncated negative binomial regression, and are adjusted for the complex sampling design.
* 0.05 <p<0.10.
**p<0.05.
†Among ever married respondents.
‡US$1=62.162 Indian rupees on 3 March 2014.
AUDIT, Alcohol Use Disorders Identification Test ; PHQ9, Patient Health Questionnaire 9; Ref., Reference category; WHODAS, WHO Disability Assessment Schedule.

consumption for all adherents of Islam, the historical record for Hindus contains a multitude of references to alcohol use, even for ceremonial usage.[51] It should be noted, though, that while religious affiliation is predictive of whether an adult drinks alcohol or not, religious affiliation was not associated with the intensity of consumption among male drinkers.

AUDIT scores were positively associated with tobacco use, depression and disability, which is broadly consistent with other data reported from India.[5 6 13 14 18 26 52] However, like Silva's study of male industrial workers in Goa,[26] we did not find a positive association of AUDIT scores with receipt of inpatient care.. Male drinkers with higher AUDIT scores had lower out-of-pocket expenditure for outpatient care, in contrast to the increased healthcare usage which has been observed for people with AUDs elsewhere in India.[16 18 26] Further research is needed to clarify this relationship. It is possible that in Sehore, chronically unwell people curtail their drinking and that heavy drinkers avoid engagement with the health sector. Taken as a whole, our findings indicate that there are multiple domains of poor health concurrently present in adults with higher AUDIT scores. We found that only a small minority of people with alcohol use disorder sought treatment, or communicated their problems with alcohol. Treatment-seeking by those with problems with alcohol in India is an infrequent occurrence,[18 25 26] and is partially due to lack of public treatment services and inaccessibility of private services.[21] Yet recognition that problems with alcohol are medical in nature is rare,[25 50] and most likely contributes to both the low supply of and demand for treatment services. Given the need for, and the low level of uptake of, services, it may be useful to consider the role of community health workers in implementing screening and brief intervention programmes.

Feelings of personal shame are commonly expressed by people with AUDs in India[18 25 50] and elsewhere. The stigmatising beliefs endorsed by adults here most likely impede treatment-seeking, and must be directly addressed as part of any increase in the supply of treatment services. A future study of explanatory models, such as has been conducted in Goa, India,[50] is an appropriate means to identify the full range of stigmatising beliefs and the means to overcome them.

There are some important limitations to consider. Since we have used a self-report questionnaire, social desirability and the individual's unwillingness to acknowledge that they drink or have specific problems with alcohol are likely to have biased our prevalence estimates downward and thereby reduced the magnitude of effect estimates in the regression models. Second, since we used a cross-sectional study design, we are unable to make causal inferences, or to establish the direction of associations. For example, we observed a positive association between AUDIT scores and symptoms of depression: while a known consequence of alcohol consumption is the manifestation of depressive

Table 4 Internal stigma beliefs among adults with alcohol use disorders in Sehore District, 2013–2014

| | 'Agree' or 'Strongly agree' | |
Belief	Per cent	95% CI
I am embarrassed by or ashamed of these problems	49.2	42.3 to 56.0
I am disappointed in myself due to these problems	47.2	39.6 to 54.8
Others think that I cannot achieve much in life because of these problems	39.7	32.9 to 46.4
I feel out of place in the world because of these problems	38.5	32.0 to 45.0
These problems have spoilt my life	38.4	30.9 to 45.9
People take me less seriously because of these problems	30.2	23.1 to 37.3
People discriminate against me due to these problems	28.7	22.2 to 35.1
Nobody would be interested in getting close to me because of these problems	27.8	21.0 to 34.6
I cannot contribute anything to society because of these problems	21.6	15.5 to 27.6
Owing to these problems, I need others to make most decisions for me	20.3	14.9 to 25.6
People ignore me just because of these problems	16.6	11.1 to 22.1

Percentage figures and 95% CIs are adjusted for the complex sampling design.

symptoms,[53] it is also common for people with psychiatric conditions to self-medicate with alcohol.[54] Finally, the effect estimates in the regression models may be biased by confounding factors. Further research must investigate the hypotheses generated in this analysis, which can adjust for potential confounders accordingly. Similarly, the prevalence and regression estimates presented here are population-level estimates and there may be important stratum-specific estimates (eg, by sex, religion or caste) which will require consideration of effect modification to assess.

In conclusion, it is evident that a need exists for effectively identifying and treating adults with AUDs. The existing capacity for service provision is inadequate to meet current need, and the treatment gap will continue to increase given that the prevalence and intensity of alcohol consumption is rising in India.[24 55] Health promotion services, informed by commonly expressed stigmatised beliefs held among those affected by AUDs and which are targeted at the most affected communities, may be an effective step in closing the treatment gap.

Data sharing statement Interested parties may notify the PRIME investigators of their interest in collaboration, including access to the data set analysed here, through the following website: https://docs.google.com/forms/d/1–4oNm5xdEPlq-RjL_4GUyCPMpVWtyaNVcfDewnx-iL4/viewform

REFERENCES

1. Whiteford HA, Degenhardt L, Rehm J, *et al*. Global burden of disease attributable to mental and substance use disorders: findings from the Global Burden of Disease Study 2010. *Lancet* 2013;382:1575–86.
2. Lim SS, Vos T, Flaxman AD, *et al*. A comparative risk assessment of burden of disease and injury attributable to 67 risk factors and risk factor clusters in 21 regions, 1990–2010: a systematic analysis for the Global Burden of Disease Study 2010. *Lancet* 2012;380:2224–60.
3. Rehm J, Mathers C, Popova S, *et al*. Global burden of disease and injury and economic cost attributable to alcohol use and alcohol-use disorders. *Lancet* 2009;373:2223–33.
4. Gupta PC. Alcohol consumption among middle-aged and elderly men: a community study from western India. *Alcohol Alcohol* 2003;38:327–31.
5. D'Costa G, Nazareth I, Naik D, *et al*. Harmful alcohol use in Goa, India, and its associations with violence: a study in primary care. *Alcohol Alcohol* 2006;42:131–7.
6. Kim S, Rifkin S, John SM, *et al*. Nature, prevalence and risk factors of alcohol use in an urban slum of Southern India. *Natl Med J India* 2013;26:203–9.
7. Jonas JB, Nangia V, Rietschel M, *et al*. Prevalence of depression, suicidal ideation, alcohol intake and nicotine consumption in rural Central India. The Central India Eye and Medical Study. *PLoS ONE* 2014;9:e113550.
8. Saxena S. Country profile on alcohol in India. In: Riley L, Marshall M, eds. *Alcohol and public health in 8 developing countries*. Geneva, Switzerland: World Health Organization, 1999:37–60. http://whqlibdoc.who.int/hq/1999/WHO_HSC_SAB_99.9.pdf?ua=1
9. World Health Organization. *The ICD-10 classification of mental and behavioural disorders: clinical descriptions and diagnostic guidelines*. Geneva: World Health Organization, 1992.
10. Gajalakshmi V, Peto R. Smoking, drinking and incident tuberculosis in rural India: population-based case-control study. *Int J Epidemiol* 2009;38:1018–25.
11. Znaor A, Brennan P, Gajalakshmi V, *et al*. Independent and combined effects of tobacco smoking, chewing and alcohol drinking on the risk of oral, pharyngeal and esophageal cancers in Indian men. *Int J Cancer J Int Cancer* 2003;105:681–6.
12. Go VF, Solomon S, Srikrishnan AK, *et al*. HIV rates and risk behaviors are low in the general population of men in Southern India

but high in alcohol venues: results from 2 probability surveys. *J Acquir Immune Defic Syndr* 2007;46:491–7.

13. Kunar BM, Bhattacherjee A, Chau N. Relationships of job hazards, lack of knowledge, alcohol use, health status and risk taking behavior to work injury of coal miners: a case-control study in India. *J Occup Health* 2008;50:236–44.

14. Pednekar MS, Sansone G, Gupta PC. Association of alcohol, alcohol and tobacco with mortality: findings from a prospective cohort study in Mumbai (Bombay), India. *Alcohol* 2012;46:139–46.

15. Nayak MB, Patel V, Bond JC, *et al.* Partner alcohol use, violence and women's mental health: population-based survey in India. *Br J Psychiatry* 2010;196:192–9.

16. Bonu S, Rani M, Peters DH, *et al.* Does use of tobacco or alcohol contribute to impoverishment from hospitalization costs in India? *Health Policy Plan* 2005;20:41–9.

17. Mayston R, Patel V, Abas M, *et al.* Determinants of common mental disorder, alcohol use disorder and cognitive morbidity among people coming for HIV testing in Goa, India. *Trop Med Int Health* 2015;20:397–406.

18. Gaunekar G, Patel V, Rane A. The impact and patterns of hazardous drinking amongst male industrial workers in Goa, India. *Soc Psychiatry Psychiatr Epidemiol* 2005;40:267–75.

19. Saxena S, Sharma R, Maulik PK. Impact of alcohol use on poor families: a study from North India. *J Subst Use* 2003;8:78–84.

20. Prasad R. Alcohol use on the rise in India. *Lancet* 2009;373:17–18.

21. Saxena S. Alcohol problems and responses: challenges for India. *J Subst Use* 2000;5:62–70.

22. Benegal V. India: alcohol and public health. *Addiction* 2005;100:1051–6.

23. Patel V. Personal views: the politics of alcoholism in India. *BMJ* 1998;316:1394.

24. Sassi F, Devaux M. Alcohol consumption and harmful drinking. 2015 May. Report No.: 79. http://www.oecd-ilibrary.org/social-issues-migration-health/alcohol-consumption-and-harmful-drinking_5js1qwkz2p9s-en

25. Pal HR, Yadav S, Joy PS, *et al.* Treatment nonseeking in alcohol users: a community-based study from North India. *J Stud Alcohol* 2003;64:631–3.

26. Silva MC, Gaunekar G, Patel V, *et al.* The prevalence and correlates of hazardous drinking in industrial workers: a study from Goa, India. *Alcohol Alcohol* 2003;38:79–83.

27. Benegal V, Chand PK, Obot IS. Packages of care for alcohol use disorders in low- and middle-income countries. *PLoS Med* 2009;6: e1000170.

28. Anderson P, Chisholm D, Fuhr DC. Effectiveness and cost-effectiveness of policies and programmes to reduce the harm caused by alcohol. *Lancet* 2009;373:2234–46.

29. Perngparn U, Assanangkornchai S, Pilley C, *et al.* Drug and alcohol services in middle-income countries. *Curr Opin Psychiatry* 2008;21:229–33.

30. Lund C, Tomlinson M, De Silva M, *et al.* PRIME: A programme to reduce the treatment gap for mental disorders in five low- and middle-income countries. *PLoS Med* 2012;9:e1001359.

31. Sinha S. District Census Handbook: Sehore. Bhopal, Madhya Pradesh, India: Directorate of Census Operations, 2014 Mar. Report No.: Series-24, Part XII-B. http://www.censusindia.gov.in/2011census/dchb/2328_PART_B_DCHB_SEHORE.pdf

32. Office of the Chief Electoral Officer. CEO MP: Voter list. In: CEO MP: Voter List [Internet]. (cited 24 Jun 2015). http://www.ceomadhyapradesh.nic.in/voterlist2015.aspx

33. Mobenzi Researcher [Internet]. Cape Town, South Africa: Clyral; http://mobenzi.com/researcher/home

34. Babor TF, Higgins-Biddle JC, Saunders JB, *et al. AUDIT: the alcohol use disorders identification test guidelines for use in primary care*. Geneva, Switzerland: World Health Organization, 2001.

35. Pal HR, Jena R, Yadav D. Validation of the Alcohol Use Disorders Identification Test (AUDIT) in urban community outreach and de-addiction center samples in north India. *J Stud Alcohol* 2004;65:794–800.

36. Nayak MB, Bond JC, Cherpitel C, *et al.* Detecting alcohol-related problems in developing countries: a comparison of 2 screening measures in India. *Alcohol Clin Exp Res* 2009;33:2057–66.

37. Boyd Ritsher J, Otilingam PG, Grajales M. Internalized stigma of mental illness: psychometric properties of a new measure. *Psychiatry Res* 2003;121:31–49.

38. Kroenke K, Spitzer RL, Williams JB. The PHQ-9. *J Gen Intern Med* 2001;16:606–13.

39. Patel V, Araya R, Chowdhary N, *et al.* Detecting common mental disorders in primary care in India: a comparison of five screening questionnaires. *Psychol Med* 2008;38:221–8.

40. Ganguly S, Samanta M, Roy P, *et al.* Patient health questionnaire-9 as an effective tool for screening of depression among Indian adolescents. *J Adolesc Health* 2013;52:546–51.

41. Sheehan D, Janavs J, Baker R, *et al.* MINI-Mini International Neuropsychiatric Interview-English Version 5.0. 0-DSM-IV. *J Clin Psychiatry* 1998;59:34–57.

42. Üstün TB, Kostanjsek N, Chatterji S, Rehm J, eds. *Measuring health and disability: manual for WHO Disability Assessment Schedule WHODAS 2.0*. Geneva: World Health Organization, 2010.

43. Beecham J, Knapp M. Costing psychiatric interventions. In: Thornicroft G, ed. *Measuring mental health needs*. 2nd edn. London: Gaskell/Royal College of Psychiatrists, 2001:200–24.

44. International Institute for Population Sciences, Macro International. *India National Family Health Survey (NFHS-3), 2005–06*. Mumbai, India: International Institute for Population Sciences, 2007.

45. Anant TCA, Das SK. Housing [Internet]. New Delhi, India: Ministry of Statistics and Progamme Implementation, 2011:352. Report No.: 44th edition. http://mospi.nic.in/Mospi_New/upload/statistical_year_book_2011/SECTOR-4-SERVICE SECTOR/CH-28-HOUSING/HOUSING-WRITEUP.pdf

46. Lund C, Waruguru M, Kingori J, *et al.* Outcomes of the mental health and development model in rural Kenya: a 2-year prospective cohort intervention study. *Int Health* 2013;5:43–50.

47. Subramanian SV, Nandy S, Kelly M, *et al.* Health behaviour in context: exploratory multi-level analysis of smoking, drinking and tobacco chewing in four states. *Econ Polit Wkly* 2004; 39:684–93.

48. Mohan D, Chopra A, Ray R, *et al.* Alcohol consumption in India: a cross sectional study. In: Demers A, Room R, Bourgault C, eds. *Surveys of drinking patterns and problems in seven developing countries*. Geneva, Switzerland: World Health Organization, 2001:103–14.

49. Ganesh KS, Premarajan KC, Subitha L, *et al.* Prevalence and pattern of alcohol consumption using Alcohol Use Disorders Identification Test (AUDIT) in rural Tamil Nadu, India. *J Clin Diagn Res* 2013;7:1637–9.

50. Nadkarni A, Dabholkar H, McCambridge J, *et al.* The explanatory models and coping strategies for alcohol use disorders: an exploratory qualitative study from India. *Asian J Psychiatry* 2013;6:521–7.

51. Murthy P. Culture and alcohol use in India. *World Cult Psychiatry Res Rev* 2015;10:27–39.

52. Pillai A, Nayak MB, Greenfield TK, *et al.* Patterns of alcohol use, their correlates, and impact in male drinkers: a population-based survey from Goa, India. *Soc Psychiatry Psychiatr Epidemiol* 2013;48:275–82.

53. Schuckit MA. Comorbidity between substance use disorders and psychiatric conditions. *Addict Abingdon Engl* 2006;101(Suppl 1):76–88.

54. Harris KM, Edlund MJ. Self-medication of mental health problems: new evidence from a national survey. *Health Serv Res* 2005;40:117–34.

55. Global status report on alcohol and health, 2014. Geneva, Switzerland: World Health Organization, 2014. http://alltitles.ebrary.com/Doc?id=10931311