

Trajectories of alcohol use disorders and their differential impact: A population based cohort study in Goa, India

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| Journal: | <i>Alcohol and Alcoholism</i> |
| Manuscript ID | ALC-17-0039.R2 |
| Manuscript Type: | Original Manuscript |
| Date Submitted by the Author: | n/a |
| Complete List of Authors: | Nadkarni, Abhijit; London School of Hygiene & Tropical Medicine; Sangath, Addictions Research Group Weiss, Helen Bhat, Bhargav Patel, Vikram; London School of Hygiene and Tropical Medicine Faculty of Epidemiology and Population Health; Sangath; Harvard Medical School |
| Keywords: | Trajectories, Alcohol Use Disorders, AUDIT, Community Cohort, India |
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3 **Trajectories of alcohol use disorders and their differential impact: A**
4 **population based cohort study in Goa, India.**
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32 Running title: Differential impact of alcohol use disorder trajectory
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36 Key words: Trajectories, alcohol use disorders, AUDIT, population cohort, Goa, India
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40 Conflict of Interest: None
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45 Funding: This work was supported by a Wellcome Trust Research Training
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47 Fellowship to Abhijit Nadkarni [Grant number WT093897MA].
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Abstract

Aims

The aim of this study was to examine trajectories of Alcohol Use Disorders (AUD) over a 6 year period and compare the bio-psycho-social correlates between these trajectories.

Methods

Community-based cohort of 1899 adult men were interviewed in 2006-08 and 2012-14. AUD were assessed using the Alcohol Use Disorder Identification Test, and potential correlates including psychosocial problems, morbidity, and physiological parameters were measured at follow-up. Logistic regression was conducted to estimate odds ratios (ORs) for the association of persistent, and incident AUD respectively with the potential correlates. Analyses were weighted to account for sampling design, number of adults aged 18–49 years in the household, and non-response.

Results

Compared with men who had recovered from AUD, there was strong evidence ($p < 0.001$) that men with persistent AUD were more likely to have marital problems, tobacco use, and raised GGT and strong evidence ($0.001 < p < 0.01$) that they were more likely to have workplace problems, social problems, increased healthcare contact, and raised MCV. Compared with men who did not have AUD at baseline and follow up, there was strong evidence ($p < 0.001$) that men with incident AUD were more likely to have workplace problems, social problems, marital problems, tobacco

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3 use, and raised GGT and strong evidence ($0.001 < p < 0.01$) that they were more likely
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5 to have hypertension, accident and injuries and CMD.
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8 9 *Conclusion*

10 This community-based longitudinal study of AUD, the first from a low and middle
11
12 income country, clearly demonstrates significant health and social consequences of
13
14 AUD in men and highlights the need for interventions for their treatment and
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16 prevention.
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20 21 22 **Short Summary**

23 Compared to persistent AUD, recovery from AUD has several benefits in health and
24
25 social domains. Compared to developing new AUD, not having AUD has several
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27 benefits in health and social domains. Sustaining the state of not having AUD or
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29 recovery can lead to accumulation of health and social capital over time.
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Background

An overwhelming majority of the estimated 2.9 million deaths globally due to substance use disorders are due to alcohol (Lim et al., 2013). Alcohol Use Disorders (AUD) (hazardous drinking, harmful drinking and dependent drinking) account for about 10% of Disability Adjusted Life Years (DALYs) caused by mental and substance use disorders (Lim et al., 2013).

Alcohol use behaviours change in frequency and intensity over time (Nadkarni et al., 2016) and studies examining such behaviours at a single time point will not represent their course and progression. However almost all research examining the trajectories of alcohol use patterns has been conducted in developed countries and predominantly focuses on adolescent and young adult populations (Clark, 2004; Thatcher and Clark, 2006). The absence of evidence from Low and Middle Income Countries (LMIC) is a major knowledge gap. Evidence from developed countries is limited in its applicability to LMIC as AUDs, like many other health risk factors, are influenced temporally by a range of contextual factors such as socio-economic conditions, and access to health services. Hence, a better contextual understanding of the trajectory and correlates of AUDs will provide information relevant for clinical evaluation, prognostication and treatment; and will inform more appropriate policy and intervention development.

In India, almost half of all drinkers drink hazardously, with the pattern of hazardous drinking characterized by heavy drinking, daily or almost daily drinking, under-socialized, solitary drinking of mainly spirits, and drinking to intoxication (Benegal, 2005). This results in high rates of alcohol-attributable mortality and prevalence of

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3 AUD relative to the per capita volume of alcohol consumed (Rehm et al., 2009).
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5 Although there is substantial evidence from cross-sectional studies about the
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7 prevalence and correlates of AUD in India (Murthy et al., 2010), the few existing
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9 cohort studies are limited by the short duration of follow-up, small sample sizes,
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11 clinic-based participants, and limited data (Kar et al., 2003; Kuruvilla and Jacob,
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13 2007; Mohan et al., 2002; Singh et al., 2008).
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19 This is the first study from a LMIC to follow a large community-based cohort and
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21 examine the longitudinal history of AUD. Our hypotheses were that men with
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23 persistent and incident AUD will have adverse bio-psycho-social correlates
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25 compared with those who have recovered from AUD or never had AUD respectively.
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29 **Methods**

30 *Setting*

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33 Goa, a state on the west coast of India, with a population of just over 1.4 million
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35 people (62% residing in urban areas) (Government of India, 2011). The
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37 epidemiological picture of drinking in Goa is characterized by a high proportion of
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39 AUD amongst male drinkers, and a range of adverse health and social impacts
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41 among those with AUD (Costa et al., 2007; Gaunekar et al., 2005; Nadkarni et al.,
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43 2016; Pillai et al., 2013; Silva et al., 2003). The study was restricted to men because
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45 of the low prevalence of drinking in Indian women (Murthy et al., 2010).
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50 *Study design:*

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52 From 2006 to 2008 a cross-sectional survey was conducted in the following socio-
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54 demographically heterogeneous study sites: urban (beach areas popular among
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3 tourists and a typical commercial and residential area), and rural areas (six
4 contiguous villages) (Pillai et al., 2013). The sampling frame was the electoral roll
5 and the population-based sample was selected through a two-stage probability
6 sampling procedure. From each randomly selected household a random male
7 participant was selected from all eligible (18-49 years) men within that household.
8 Refusal rates for randomly selected households were 1.5%. All men who were
9 originally screened in the baseline survey were approached again to measure a
10 range of potential correlates in 2012-2014.
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20 21 22 *Baseline data*

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24 Baseline socio-demographic data (e.g. age, education) were collected. AUD was
25 defined by the Alcohol Use Disorders Identification Test (AUDIT) using a cutoff score
26 of ≥ 8 (Saunders et al., 1993). The AUDIT has been validated and used in India
27 (Babu and Kar, 2010; Pal et al., 2004), and has been translated into Konkani (Goan
28 vernacular), using a systematic translation-back translation method (Silva et al.,
29 2003).
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40 41 *Follow up procedures*

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43 At follow-up, all consenting participants were administered a self-report
44 questionnaire and biological assessments by trained research workers using a
45 standard protocol. The research workers were blind to the baseline AUD status of
46 the participants and the study hypotheses to avoid non-random misclassification of
47 potential correlates. Quality control was conducted by re-interviewing randomly
48 selected participants (10%) by the research coordinator, direct observation of
49 assessments done by the research workers, and re-testing of randomly selected
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3 blood samples at an independent laboratory. If a participant was not available at the
4 registered address, the research worker would visit again and the participant would
5 be classified as a drop-out only after four failed visits. If the participant had moved
6 house, then an attempt would be made to contact him over the phone and to obtain
7 the new address from the neighbours. Finally, an attempt would be made to identify
8 the participant's new address using the most recent electoral rolls.
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18 *Follow up data*

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20 Besides the AUDIT score, the following data was collected at assessment:

21 A) Self-report using a structured questionnaire:

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25 1. Problems at work directly related to drinking: Questions which asked about
26 any drinking related illness which kept the drinker from working on his regular
27 activities for a week or more, losing or nearly losing a job because of drinking,
28 people at work indicating that the drinker should cut down on drinking, and
29 drinking hurting the chances for promotion/salary increases/bonuses/better
30 jobs.
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- 33 2. Number of workdays lost due to poor health in past 28 days measured using
34 an item derived from the WHO Health and Work Performance Questionnaire
35 (HPQ) (Kessler et al., 2003).
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- 38 3. Marital problems related to drinking: Questions which asked about a spouse
39 getting angry about the drinking or the way the drinker behaved while
40 drinking, and/or a spouse threatening to leave the drinker because of his
41 drinking.
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3 4. Questions about physical abuse (slapped, hit, kicked, punched wife/partner or
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5 done something else that did or could have hurt her physically) of
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7 partner/spouse.
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10 5. Social problems: Questions used to assess social harm of drinking in the
11
12 National Alcohol Surveys conducted by the Alcohol Research Group at
13
14 Berkeley, USA and included those about getting into a heated argument while
15
16 drinking, getting into a fight while drinking, prominent people from society (e.g.
17
18 community elder) questioning or warning him because of his drinking, drinking
19
20 contributing to him hurting or harassing someone else (emotionally, physically
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22 or sexually), getting into trouble because of drunk driving, and being caught/
23
24 fined/threatened by the police or arrested for drunk driving (2001).
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- 27 6. Self-reported physical health problems (hypertension, head injury with loss of
28
29 consciousness, and diabetes) using questions from the 10/66 Dementia
30
31 Research Group population-based research programme (Prince et al., 2007).
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- 34 7. Accidents or injuries.
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- 36 8. Mental, Neurological and Substance Use (MNS) disorders
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38 a. Current use of tobacco (smoked and/or chewed).
39
40 b. Current major depressive episode diagnosed using the Mini
41
42 International Neuropsychiatric Interview (MINI 6.0) a validated short,
43
44 structured diagnostic interview for DSM-IV and ICD-10 psychiatric
45
46 disorders (Sheehan et al., 1998), used in India (Salve et al., 2012).
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48 c. Common Mental Disorders (CMD) assessed using the validated 12
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50 item General Health Questionnaire (GHQ 12) (Goldberg, 1978) which
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52 has been widely used in the study setting (Patel et al., 2008).
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3 9. Health service utilization was measured using the adapted version of the
4 validated Client Service Receipt Inventory (CSRI) (Chisholm et al., 2000), which
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7 has been used in the study setting (Patel et al., 2003).
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11 B) Clinical and biological parameters: blood pressure (BP), height, weight, Mean
12 Corpuscular Volume (MCV) and Gamma Glutamyl Transferase (GGT). MCV value of
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14 >92 fL and GGT value of >50 IU/L were coded as abnormal. BMI of <18.5 kg/m² or
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16 >24.9 kg/m² was coded as 'unhealthy BMI'.
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20 21 22 23 *Ethics*

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25 Ethical approval was obtained from the Sangath Institutional Review Board (IRB),
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27 ethics committee of the London School of Hygiene and Tropical Medicine (LSHTM)
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29 and the Indian Council of Medical Research. Each research worker completed the
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31 NIH Protecting Human Research Participant online course. Results of the blood tests
32
33 and their interpretation were fed back to the participants. Participants with abnormal
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35 health parameters were offered referral to the local primary healthcare centre.
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37 Participants diagnosed with AUD, major depressive episode or CMD were offered
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39 free clinical assessment and treatment with a psychiatrist.
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45 46 *Statistical analyses*

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48 Inverse probability weights were applied to the data to account for the baseline
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50 sampling design, age distribution, rural and urban sample sizes, number of adults
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52 aged 18–49 years in the household (at baseline), and non-response (at baseline).
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54 The weights considered village or area population size, number of gender-specific
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56 adults aged 18-49 in the household, non-response, and a three category age
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3 distribution (18-29, 30-39, 40-49) within urban and rural areas. For example, for the
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5 village size factor, the sum of the weights for respondents in a village were adjusted
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7 such that the resulting sum of the weights for all individuals within the village divided
8
9 by the total N (gender and urban/rural sample size) equalled the corresponding
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11 proportion created from the electoral rolls. Similarly, weights were normalized such
12
13 that households where there were twice as many males aged 18-49 living in it
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15 compared to another household had twice the weighting factor. Baseline socio-
16
17 demographic characteristics were compared by baseline AUD status using chi-
18
19 squared or t-tests as appropriate. Baseline socio-demographic characteristics and
20
21 AUD status were compared by follow-up status. Multivariable logistic regression was
22
23 used to identify factors independently associated with loss to follow-up (LTFU).
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30 A variable for drinking trajectories was created with the following categories:
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32 Persistent non-AUD (no AUD at baseline and follow up), incident AUD (no AUD at
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34 baseline, AUD at follow up), recovered AUD (AUD at baseline, no AUD at follow-up),
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36 and persistent AUD (AUD at baseline and follow-up). The baseline characteristics of
37
38 men in these groups were compared using chi squared test (for proportions), t-test
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40 (for means of two groups), and one way ANOVA (for means of more than two
41
42 groups) as appropriate. Multivariable logistic regression was conducted to calculate
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44 ORs and 95% confidence intervals (CIs) for the association of persistent AUD
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46 (recovered AUD as comparator) and incident AUD (no AUD at baseline and follow
47
48 up as comparator) with bio-psycho-social correlates, adjusted for baseline socio-
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50 demographic factors. Sensitivity analyses were conducted using propensity scores.
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52 The Hosmer-Lemeshow test was applied to the logistic regression propensity model
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54 to establish goodness-of-fit to the data. The propensity score was then used to
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3 generate inverse probability of treatment (IPT) weights which were applied to the
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5 multiple regression models to account for selection bias resulting from missing data
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7 due to LTFU. All analyses were performed using STATA 14.
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For Peer Review

Results

At baseline the mean age of the cohort (n=1899) was 32.8 (SD 8.6) years, 1077 (56.7%) resided in rural areas, 1077 (56.7%) were married or co-habiting, 93 (5.0%) were illiterate and 231 (12.2%) were unemployed. Compared with men without AUD, those with AUD were older (34.5 [7.8] years vs 32.4 [8.8] years; $p=0.001$), resided in urban areas (50.3% vs 41.8%; $p=0.005$), married (64.8% vs 55.1%; $p=0.001$), illiterate (6.8% vs 4.6%; $p=0.10$), and employed (90.7% vs 87.2%; $p=0.07$). On multivariable analysis the only variable strongly associated with AUD at baseline was urban residence (OR=1.39; 95%CI 1.09-1.77; $p<0.001$).

Over the follow up period, 385 (20.3%) participants were LTFU (49 outward migration, and 336 refusals) and 62 (3.3%) had died. Having AUD at baseline was not associated with LTFU. On multivariable analysis the variables associated with LTFU were residence in urban areas (OR=2.74; 95%CI 2.11-3.56; $p<0.001$) and being literate (OR=1.16; 95%CI 1.02-1.33; $p<0.02$). Both these were included in the subsequent logistic regression models.

1107 (76.3%; 95%CI 74.0-78.5) men had no AUD at baseline and at follow-up, 106 (7.3%; 95%CI 6.0-8.8) had incident AUD, 117 (8.1%; 95%CI 6.7-9.6) had recovered AUD, and 121 (8.3%; 95%CI 7.0-9.9) had persistent AUD. Men with persistent and recovered AUD tended to be older, living in urban areas, married and literate (Table 1).

(Table 1 here)

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3 Table 2 compares prevalence of each correlate by AUD trajectory and the
4 association between AUD trajectory and correlates. The prevalence of the following
5 correlates was highest among men with persistent AUD, followed by those with
6 incident and then recovered AUD: workplace problems, social problems, marital
7 problems, tobacco use, CMD, healthcare contact, and raised GGT. Conversely, the
8 prevalence of hypertension was highest for men with recovered AUD, followed by
9 those with incident and persistent AUD. The prevalence of raised MCV was highest
10 for men with persistent AUD, followed by those with incident and persistent AUD.
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23 *Multivariable analysis:* Compared with men who had recovered from their AUD, there
24 was very strong evidence ($p < 0.001$) that men with persistent AUD were more likely
25 to have marital problems (OR 12.9; 95% CI 4.2-39.0), tobacco use (OR 3.5; 95% CI
26 1.9-6.4), and raised Gamma Glutamyl Transferase (OR 3.4; 95% CI 1.8-6.5) and
27 strong evidence ($0.001 < p < 0.01$) that they were more likely to have workplace
28 problems (OR 9.1; 95% CI 2.5-33.3), social problems (OR 19.7; 95% 2.6-151.6),
29 increased healthcare contact (OR 2.1; 95% CI 1.2-3.7), and raised MCV (OR 2.5;
30 95% CI 1.4-4.7). In addition, there was evidence ($0.01 < p < 0.05$) that men with
31 persistent AUD were more likely to have diabetes (OR 2.8; 95% CI 1.1-7.0), and less
32 likely to have hypertension (OR 0.3; 95% CI 0.1-0.8). Compared with men who did
33 not have AUD at baseline and follow up, there was very strong evidence ($p < 0.001$)
34 that men with incident AUD were more likely to have workplace problems (OR 12.2;
35 95% CI 4.8-31.0), social problems (OR 10.1; 95% CI 3.7-27.5), marital problems (OR
36 8.1; 95% CI 4.1-16.0), tobacco use (OR 4.5; 95% CI 2.9-7.2), and raised GGT (OR
37 6.2; 95% CI 3.7-10.3) and strong evidence ($0.001 < p < 0.01$) that they were more likely
38 to have hypertension (OR 2.5; 95% CI 1.5-4.4), accident and injuries (OR 1.9; 95%
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3 1.1-3.3) and CMD (OR 3.6; 95% CI 1.4-9.2). In addition, there was evidence that
4 men with incident AUD were more likely ($0.01 < p < 0.05$) to have diabetes (OR 2.2;
5 95% CI 1.1-4.5). Finally, there were some associations with persistent AUD which
6 had large OR (>4.0), but wide confidence intervals including 1 and these included
7 CMD and admission to hospital (Table 2). The results remained similar even after
8 adjusting for the propensity scores.
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23 Discussion

24 This study describes the different longitudinal trajectories of AUD and the correlates
25 associated with these trajectories in a community cohort of men from India. There
26 was no clear and consistent differential pattern of association of various socio-
27 demographic correlates with AUD trajectories. However, there was a clear pattern of
28 differential association of various correlates with AUD trajectories. Persistent AUD
29 and incident AUD were associated with a wide range of adverse correlates
30 compared to recovered AUD and those with no AUD at baseline and follow up
31 respectively. Hence, while interpreting our findings we need to consider the
32 coherence of the narrative resulting from the pattern of the highly statistically
33 significant and relatively less statistically significant associations. Furthermore, we
34 also need to take into consideration the wide 95% confidence intervals of some of
35 the statistically significant findings, as they reflect limited precision of those findings.
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54 We found that age, area of residence, and marital status were predictors of drinking
55 trajectories. However, the clinical utility of such socio-demographic predictors is
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3 doubtful as the same socio-demographic factor might predict more than one
4 trajectory e.g. illiteracy predicted development of new AUD, recovery, and
5 persistence of AUD. Some studies have been able to identify similar long-term
6 predictors of drinking outcomes. Generally older people were seen to have poorer
7 outcomes and particularly in less severe types of AUD it was found that the younger
8 the subject, higher the likelihood of improvement (Ojesjo, 1981). Other factors that
9 have been found to predict prognosis in AUD include severity of AUD, financial
10 condition, health status, interpersonal relations etc.; and a favorable prognosis
11 predicted by emotional and social stability, and a satisfactory combination of work
12 and interpersonal adaptation (Rosenberg, 1993; Sobell et al., 2000). However overall
13 the evidence on predictors of outcome is not substantial (Gual et al., 1999) and most
14 that exists is in clinical samples. It is difficult to compare population studies like ours
15 with clinical samples, as there are important differences in sampling strategies,
16 nature of the sample, setting etc.
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36 Our findings of correlates of AUD trajectories are consistent with evidence about
37 outcomes of drinking trajectories from developed countries which indicates that
38 individuals with AUD experience more problems during the follow-up interval, than
39 individuals who become controlled drinkers or abstainers (Finney and Moos, 1991;
40 McCabe, 1986; Vaillant and Milofsky, 1982). These include social problems,
41 accidents and injuries, psycho-social problems, higher rates of health problems, and
42 hospitalizations in sustained AUD compared to recovered AUD (Gual et al., 2009;
43 McCabe, 1986; Ojesjo, 1981). More importantly, our key findings are that recovered
44 AUD and not having AUD at baseline and follow up has better bio-psycho-social
45 correlates compared to persistent AUD or incident AUD respectively. This is
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3 consistent with other studies that have highlighted the resources that can be
4 accumulated over time (e.g., health, employment, strong social relations) as the
5 state of not having an AUD is sustained (Brown et al., 1991; Brown and Schuckit,
6 1988; Dennis et al., 2007; Levy et al., 1981; Maisto et al., 1998). Such positive
7 changes in a range of outcomes (including drinking outcomes) form an important
8 component of 'recovery' viz a multidimensional construct including not having AUD,
9 as well as improvements in other domains (e.g., mental or physical), and satisfaction
10 with environment and relationships with others (Garner et al., 2014).

11
12 One of the major strengths of this study is that it is a community sample. Most
13 studies examining the progression and correlates in AUD have drawn samples from
14 clinic populations that are biased by the non-inclusion of less severe forms of AUD
15 and also by other confounders like treatment provision. Such studies are not very
16 useful in understanding the progression and correlates of AUDs in resource poor
17 settings. This is the first of its kind study from India or indeed any LMIC. It allows us
18 to understand the differential association of correlates based on AUD trajectories in
19 the context of a LMIC. The large size of the sample, reasonably long period of follow
20 up, good follow up rates, and use of structured questionnaire are other strengths of
21 the study. Our study has some limitations as well. We used the electoral register as
22 a sampling frame as it is the most complete and accessible national source of
23 residential addresses. However, this strategy can lead to selection bias for several
24 reasons such as people not choosing to register themselves, and recent migrants
25 not being represented on the electoral rolls. Some of the participants in the cohort
26 might have received treatment for their AUD which might have influenced the course
27 as well as the impact of the various trajectories. However, considering the scarcity of
28 services for AUD in the study setting it is unlikely that many participants would have
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3 received such treatment. Although we have defined the trajectory based on the
4 presence/absence of AUD at two time points, due to the fluctuating course of AUD, it
5 is possible that someone who we have labeled as persistent AUD has actually had a
6 period of abstinence in the interim period. Furthermore, since we did not have
7 baseline data of the various correlates measured at follow up, we could not adjust for
8 those at baseline. This in turn means that we can only make conclusions regarding
9 associations between the AUD trajectories and adverse correlates, but cannot make
10 definitive conclusions about direction of causality e.g. workplace problems. However,
11 for some of the associations reverse causality does not appear plausible and it is
12 possible to make assumptions about causality. For example, although it is possible
13 that social or interpersonal problems could be due to drinking or lead to drinking,
14 someone starting to drink because they have raised GGT appears implausible.
15 Finally, many measurements in our study, including alcohol use, are self-reported
16 and could be biased due to socially desirable response.
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36 Our findings have clinical, research and policy implications. The key message is that
37 recovery from AUD holds several benefits over persistent AUD. Furthermore,
38 developing new AUD is associated with a range of adverse bio-psycho-social
39 correlates. Hence, in LMIC, it is important for policy makers to invest in the delivery
40 of interventions that are focused on prevention and management of AUD, a set of
41 disorders which have one of the largest treatment gaps amongst all mental,
42 neurological and substance use disorders (Kohn et al., 2004). Despite the
43 differences in our setting from previous studies from developed countries, our
44 findings show the universality of the adverse correlates associated with the various
45 AUD trajectories. This could mean that the general principles underlying policies,
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3 services and interventions from developed countries could be adopted in LMIC after
4 appropriate contextual adaptations. We had low power to detect some of the
5 associations that we have described above (such as physical abuse) and these need
6 to be examined in larger studies powered to test these associations as these are
7 critical issues deserving further exploration. Finally, a key research question that
8 needs to be examined in greater detail is the predictors of the various AUD
9 trajectories as these will inform the development of appropriate programmes for the
10 prevention and treatment of AUD.
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For Peer Review

Table 1: Comparison of baseline sociodemographic profile of the AUD trajectories.

| Variable | No AUD at baseline & follow up n (%) | Incident AUD n (%) | Recovered AUD n (%) | Persistent AUD n (%) | p value |
|-------------------------------|---|-----------------------|------------------------|-------------------------|---------|
| Total number | N=1107 (76.3%) | N=106 (7.3%) | N=117 (8.1%) | N=121 (8.3%) | |
| Mean age in years (SD) | 32.6 (8.7) | 32.6 (9.0) | 34.0 (7.9) | 34.7 (7.6) | 0.03 |
| Residence | | | | | 0.04 |
| Rural | 695 (77.7) | 67 (7.5) | 58 (6.5) | 74 (8.3) | |
| Urban | 412 (74.0) | 39 (7.0) | 59 (10.6) | 47 (8.4) | |
| Marital status | | | | | 0.006 |
| Married or co-habiting | 613 (73.7) | 60 (7.2) | 73 (8.8) | 86 (10.3) | |
| Never married or post-marital | 494 (79.8) | 46 (7.4) | 44 (7.1) | 35 (5.7) | |
| Educational status | | | | | 0.07 |
| Illiterate | 41 (64.1) | 9 (14.1) | 6 (9.4) | 8 (12.5) | |
| Literate | 1034 (76.7) | 93 (6.9) | 109 (8.1) | 113 (8.4) | |
| Employment status | | | | | 0.80 |
| Unemployed | 132 (79.0) | 12 (7.2) | 11 (6.6) | 12 (7.2) | |
| Employed | 975 (75.9) | 94 (7.3) | 106 (8.3) | 109 (8.5) | |

Table 2: Outcomes associated with AUD trajectories

| Variable | Recovered AUD n (%)** | Persistent AUD n (%)** | No AUD at baseline & follow up n (%)** | Incident AUD n (%)** | p value | Multivariable analysis* | |
|--|-----------------------------|------------------------------|---|----------------------------|---------|---|--|
| | | | | | | Persistent AUD [Comparator is recovered AUD] OR (95% CI) | Incident AUD [Comparator is no AUD at baseline & follow up] OR (95% CI) |
| Total number | N=117 | N=121 | N=1107 | N=106 | | | |
| Social problems | | | | | | | |
| Workplace problems since baseline interview | 3 (4.7) | 32 (30.8) | 7 (2.4) | 24 (25.0) | <0.001 | 9.1 (2.5-33.3) | 12.2 (4.8-31.0) |
| Marital problems since baseline interview | 4 (6.3) | 50 (48.5) | 19 (7.2) | 36 (40.0) | <0.001 | 12.9 (4.2-39.0) | 8.1 (4.1-16.0) |
| Social problems since baseline interview | 1 (1.5) | 29 (26.9) | 6 (2.0) | 18 (17.8) | <0.001 | 19.7 (2.6-151.6) | 10.1 (3.7-27.5) |
| Lost \geq 1 workdays due to poor | 14 (13.7) | 20 (22.5) | 127 (12.6) | 15 (16.3) | 0.27 | 1.6 (0.7-3.5) | 1.5 (0.8-2.7) |

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|---|-----------|-----------|------------|-----------|--------|----------------|---------------|
| health in past 28 days | | | | | | | |
| Physical abuse of partner/spouse in past 12 months | 4 (4.0) | 11 (11.6) | 24 (2.8) | 6 (7.2) | 0.14 | 2.9 (0.8-10.1) | 2.4 (0.9-6.1) |
| Physical health problems | | | | | | | |
| Hypertension diagnosed after baseline interview | 18 (15.4) | 27 (22.3) | 123 (11.1) | 22 (21.2) | 0.36 | 1.6 (0.8-3.3) | 2.5 (1.5-4.4) |
| Head injury with loss of consciousness after baseline interview | 9 (7.7) | 13 (10.9) | 61 (5.5) | 8 (7.6) | 0.60 | 1.3 (0.5-3.4) | 1.4 (0.6-3.1) |
| Diabetes diagnosed after baseline interview | 8 (6.8) | 20 (16.7) | 71 (6.4) | 11 (10.6) | 0.06 | 2.8 (1.1-7.0) | 2.2 (1.1-4.5) |
| Accidents or injuries in past 12 months | 16 (13.7) | 30 (25.0) | 113 (10.2) | 18 (17.1) | 0.07 | 1.8 (0.9-3.6) | 1.9 (1.1-3.3) |
| Mental health and substance use/abuse | | | | | | | |
| Used tobacco in past 12 months | 53 (45.3) | 91 (75.2) | 266 (24.0) | 63 (59.4) | <0.001 | 3.5 (1.9-6.4) | 4.5 (2.9-7.2) |
| Current major depressive episode | 3 (2.6) | 10 (8.4) | 32 (2.9) | 3 (2.9) | 0.06 | 3.5 (0.9-13.5) | 1.0 (0.3-3.3) |
| Common mental disorders | 2 (1.7) | 11 (9.2) | 17 (1.5) | 7 (6.7) | 0.04 | 4.8 (0.9-24.6) | 3.6 (1.4-9.2) |
| Health service utilisation | | | | | | | |

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|---|-----------|-----------|------------|-----------|--------|----------------|----------------|
| Contact with health worker in past 2 months | 33 (28.2) | 55 (45.5) | 422 (38.1) | 46 (43.8) | 0.01 | 2.1 (1.2-3.7) | 1.3 (0.9-2.0) |
| Admitted to hospital in the past two months | 2 (1.7) | 8 (6.6) | 21 (1.9) | 4 (3.8) | 0.16 | 4.1 (0.8-21.4) | 1.9 (0.6-5.9) |
| Biological parameters | | | | | | | |
| Hypertension | 16 (14.2) | 5 (4.3) | 78 (7.1) | 11 (10.7) | 0.04 | 0.3 (0.1-0.8) | 1.6 (0.8-3.3) |
| Unhealthy BMI | 48 (43.6) | 58 (51.8) | 469 (43.2) | 46 (44.7) | 0.42 | 1.3 (0.8-2.3) | 1.1 (0.8-1.7) |
| Raised MCV | 34 (40.5) | 70 (63.6) | 245 (27.1) | 34 (36.6) | <0.001 | 2.5 (1.4-4.7) | 1.5 (1.0-2.4) |
| Raised GGT | 21 (25.0) | 58 (52.7) | 83 (9.1) | 33 (35.1) | <0.001 | 3.4 (1.8-6.5) | 6.2 (3.7-10.3) |

*Adjusted for baseline age, education, employment status, marital status, area of residence, socioeconomic status

**Denominator is the number of participants in the trajectory with follow up data for the relevant outcome available

Supplementary Table: Multivariable analyses with and without weighting for propensity scores

| Variable | Multivariable analysis* | | Weighted for propensity scores | |
|--|---|--|---|--|
| | Persistent AUD [Comparator is recovered AUD] OR (95% CI) | Incident AUD [Comparator is no AUD at baseline & follow up] OR (95% CI) | Persistent AUD [Comparator is recovered AUD] OR (95% CI) | Incident AUD [Comparator is no AUD at baseline & follow up] OR (95% CI) |
| Total number | | | | |
| Social problems | | | | |
| Workplace problems since baseline interview | 9.1 (2.5-33.3) | 12.2 (4.8-31.0) | 8.5 (2.2-33.1) | 12.5 (4.9-31.9) |
| Marital problems since baseline interview | 12.9 (4.2-39.0) | 8.1 (4.1-16.0) | 13.3 (5.0-35.5) | 7.7 (3.9-15.3) |
| Social problems since baseline interview | 19.7 (2.6-151.6) | 10.1 (3.7-27.5) | 15.9 (2.1-121.3) | 10.0 (3.6-27.3) |
| Lost ≥ 1 workdays due to poor health in past 28 days | 1.6 (0.7-3.5) | 1.5 (0.8-2.7) | 1.6 (0.7-3.6) | 1.6 (0.9-2.9) |
| Physical abuse of partner/spouse in past 12 months | 2.9 (0.8-10.1) | 2.4 (0.9-6.1) | 3.0 (0.8-11.0) | 2.2 (0.9-5.8) |

| | | | | |
|---|----------------|---------------|----------------|---------------|
| Physical health problems | | | | |
| Hypertension diagnosed after baseline interview | 1.6 (0.8-3.3) | 2.5 (1.5-4.4) | 1.6 (0.8-3.2) | 2.7 (1.5-4.8) |
| Head injury with loss of consciousness after baseline interview | 1.3 (0.5-3.4) | 1.4 (0.6-3.1) | 1.3 (0.5-3.3) | 1.5 (0.6-3.5) |
| Diabetes diagnosed after baseline interview | 2.8 (1.1-7.0) | 2.2 (1.1-4.5) | 2.8 (1.2-7.0) | 1.8 (0.8-4.1) |
| Accidents or injuries in past 12 months | 1.8 (0.9-3.6) | 1.9 (1.1-3.3) | 1.8 (0.9-3.7) | 1.9 (1.0-3.4) |
| Mental health and substance use/abuse | | | | |
| Used tobacco in past 12 months | 3.5 (1.9-6.4) | 4.5 (2.9-7.2) | 3.5 (1.9-6.3) | 5.3 (3.2-8.9) |
| Current major depressive episode | 3.5 (0.9-13.5) | 1.0 (0.3-3.3) | 3.6 (1.0-13.2) | 1.0 (0.3-3.8) |
| Common mental disorders | 4.8 (0.9-24.6) | 3.6 (1.4-9.2) | 4.5 (0.8-25.4) | 3.4 (1.3-8.7) |
| Health service utilisation | | | | |
| Contact with health worker in past 2 months | 2.1 (1.2-3.7) | 1.3 (0.9-2.0) | 2.1 (1.2-3.7) | 1.5 (0.9-2.3) |
| Admitted to hospital in the past two months | 4.1 (0.8-21.4) | 1.9 (0.6-5.9) | 3.9 (0.7-22.5) | 2.3 (0.7-7.5) |

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| Biological parameters | | | | |
|------------------------------|---------------|----------------|---------------|---------------|
| Hypertension | 0.3 (0.1-0.8) | 1.6 (0.8-3.3) | 0.3 (0.1-0.7) | 1.6 (0.8-3.2) |
| Unhealthy BMI | 1.3 (0.8-2.3) | 1.1 (0.8-1.7) | 1.3 (0.8-2.3) | 1.2 (0.7-1.8) |
| Raised MCV | 2.5 (1.4-4.7) | 1.5 (1.0-2.4) | 2.5 (1.4-4.6) | 1.7 (1.0-2.7) |
| Raised GGT | 3.4 (1.8-6.5) | 6.2 (3.7-10.3) | 3.5 (1.8-6.8) | 5.3 (3.1-9.0) |

*Adjusted for baseline age, education, employment status, marital status, area of residence, socioeconomic status

**Denominator is the number of participants in the trajectory with follow up data for the relevant outcome available