




## Original Article

# Dizziness is Associated with Poor Mental and Physical Health Outcomes: a Cross-Sectional National Study of Middle-Aged and Older Adults in India

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## ABSTRACT

### Article history

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**Introduction:** Dizziness may be associated with negative health outcomes. This study aimed to determine the associations between dizziness and mental and physical health outcomes in middle-aged and older community-dwelling adults in India.

**Methods:** Cross-sectional data from 72,262 individuals ( $\geq 45$  years) of the Longitudinal Ageing Study in India (LASI) Wave 1 in 2017-2018 were analyzed. Dizziness was assessed with the question of having persistent or troublesome dizziness or light headedness in the past two years.

**Results:** More than one in seven participants (13.7%) reported past 2-years dizziness. In adjusted logistic, linear and Poisson regression analyses, dizziness was associated with worse self-rated health status, lower life satisfaction, major depressive disorder, insomnia symptoms and severe fatigue. Regarding physical health, dizziness increased the odds of pain conditions, cardiovascular conditions, chronic lung disease, functional limitations, fall history, hearing loss, impaired vision and higher number of medications currently used. In addition, in the unadjusted analysis, dizziness was negatively associated with cognitive functioning.

**Conclusion:** Dizziness was associated with six poor mental health and eight poor physical health outcomes. Findings support multidimensional management of dizziness in the general population.

**Keywords:** Dizziness, Health, Aged, India

## Introduction

"Dizziness is a general term to explain the feeling we have when there is something wrong with our sense of balance. Many people who experience dizziness find it difficult to explain exactly how it makes them feel. For example, some people who feel dizzy, light-headed, giddy, or off-balance describe the feeling as if they or their surroundings are spinning around." (1). In a review of 20 studies in the adult population found "lifetime prevalence estimates of significant dizziness ranged between 17 and 30%, and for vertigo between 3 and

10%." (2). In general population surveys, the prevalence of dizziness was 20.1 % in Korea ( $\geq 40$  years) (3), 24. 5% in Nigeria ( $\geq 65$  years) (4), and 14.6% in India ( $\geq 65$  years) (5). In a cross-sectional study in a geriatric outpatient clinic ( $\geq 65$  years) in rural central India, the prevalence of dizziness/vertigo was 3% (6).

Fewer studies have been conducted on the associations between dizziness and health outcomes, in particular, in low resourced countries. For example, in a population-based survey in Southern Germany vestibular hypo

function was associated with worse self-rated health (7). Some studies found an association between dizziness and mental health problems, e.g., anxiety (8); being nervous (9), depression (8), depressive symptoms (9), mental and emotional stress (10), mental or psychological disorders (11, 12), somatization (13) and cognitive impairment (11). Dizziness has been found associated with various pain conditions, such as pain in neck or shoulder and muscle tension (8); shoulder pain/stiffness (12); chronic pain syndrome (12), and migraine (14). Furthermore, dizziness was found associated with cardiovascular conditions (15), hypertension (16), cardiovascular risk score (9), stroke/cerebral haemorrhage (12), angina pectoris (12), chronic lung diseases, such as chronic bronchitis/emphysema (12), and polypharmacy (12, 15).

Several studies showed that dizziness is associated with multiple neurosensory deficits (9), including various hearing problems (8), hearing loss, hearing impairment (7), ear pressure (7), tinnitus (8), and impaired vision (15). Moreover, associations between dizziness and functional disability (17, 18), loss of autonomy and decreased chances for independent living (19), impaired mobility (7), impaired balance (7), gait disturbance (20), and falls (7, 21) were found. There is a lack of studies, in particular in low resourced countries, investigating associations between dizziness and a wide range of mental and physical health outcomes. Therefore, this study aimed to determine the associations between dizziness and mental and physical health outcomes in middle-aged and older community-dwelling adults in India.

## Method

### Sample and procedures

Cross-sectional and nationally representative data of the "Longitudinal Ageing Study in India Wave 1, 2017-2018" were analysed; "the overall household response rate is 96%, and the overall individual response rate is 87 %" (22). In a household survey, "interview, physical measurement and biomarker data were collected from individuals aged 45 and above and their spouses, regardless of age" (22).

### Measures

#### Outcome variables

##### Mental health

Self-rated health status was sourced from the question, "In general, would you say your health is excellent, very good, good, fair, or poor?" Responses were coded as "1=poor, 2=fair, 3=good, 4=very good, and 5=excellent", with a higher score indicating better self-rated health status (22). Self-rated health has strong predictive validity for mortality (23).

Life satisfaction was measured with the 5-item "Satisfaction With Life Scale (SWLS)" (24), with higher scores (5-35) indicative of greater life satisfaction (Cronbach's alpha was 0.86 in this study).

Cognitive functioning was assessed with "tests for immediate and delayed word recall, serial 7s, and orientation based on the Mini-Mental State Exam" (scores

0-32, with higher scores showing higher cognitive functioning) (25).

Major depressive disorder (MDD) was measured with the "Composite International Diagnostic Interview short form (26). "Those with a score  $\geq 3$  were considered to meet the criteria for having MDD in the previous 12 months; MDD symptomology scores ranged from 0 to 7." (27).

Insomnia symptoms were measured with the Jenkins Sleep Scale (JSS-4) (28) (Cronbach alpha 0.80 in this survey). "Participants who scored 1 on any of the four symptoms were considered to have insomnia symptoms." (29). The "JSS-4 proved excellent reliability and it demonstrated good construct validity." (30).

Severe fatigue was sourced from the question, "Have you had persistent severe fatigue or exhaustion in past two years?" (Yes/No) (22).

##### Physical health

Pain conditions included past two years "back pain or problem, pain or stiffness in joints, pain or stiffness in joints (Yes/No) and past year "diagnosed with or suffered from painful teeth" (Yes/No) (22). For descriptive results pain conditions were coded as 1 = any pain condition and 0=no pain condition and for the Poisson regression model as number of pain conditions.

##### Cardiovascular conditions

1) Hypertension was classified as "systolic blood pressure (BP)  $\geq 140$  mm Hg and/or diastolic BP  $\geq 90$  mm Hg (based on the last two averaged of three readings) or where the participant is currently on antihypertensive medication." (31). Self-reported conditions included,

2) "Chronic heart diseases such as coronary heart disease (heart attack or Myocardial Infarction), congestive heart failure, or other chronic heart problems,"

3) Stroke (22); 4) Angina was assessed with the "World Health Organization's Rose angina questionnaire" (32) and defined based on "discomfort at walking uphill or hurrying, or at an ordinary pace on level ground. Furthermore, the pain should be located at the sternum or in the left chest and arm, causing the patient to stop or slow down, and the pain should resolve within 10 minutes when the patient stops or slows down." (33). For descriptive results 1-4 cardiovascular conditions were coded 1 and 0 = none and for the Poisson regression model as number of cardiovascular conditions.

Chronic lung disease ("asthma, chronic obstructive pulmonary disease/chronic bronchitis, or other chronic lung problems") was measured by self-report (Yes/No) (22).

Functional limitations were defined as  $\geq 2$  of six Activities of Daily Living (ADL) and of seven Instrumental Activities of Daily Living (IADL) (34, 35). Falls were assessed with the question, "How many times have you fallen in the last 2 years?" (Number of times ...) (22). Responses were coded into 0 and 1 = any falls.

Hearing loss was defined as having "diagnosed with any hearing or ear-related problem or condition", and impaired vision as "self-reported poor or very poor far and near eyesight despite use of corrective lenses" (22).

Medication use was assessed for the treatment of ten conditions (Yes/No), as follows:

- “1) In order to control your blood pressure or hypertension, are you currently taking any medication?  
 2) During the last two years, did you take medications and treatments for symptoms (pain, nausea, rashes) of cancer?  
 3) Are you currently taking any medication for your heart disease?  
 4) Are you currently taking any medication or receiving other treatments for your arthritis, rheumatism, or osteoporosis?  
 5) Are you currently taking tranquilizers, antidepressants, or other types of medication for neurological or psychiatric problem(s)?  
 6) Do you take analgesics (Oral/ Injectable) to get relief from the pain?  
 7) Are you currently taking any medications because of your stroke or its complications?  
 8) Do you regularly take medications to help lower your cholesterol?  
 9) In the past 1 month, have you taken any medications or used other treatments to help you sleep?  
 10) In order to treat or control your diabetes or high blood sugar, are you currently taking medications that you swallow?” (22). The ten uses of medications were summed and used as a binary measure (1 = 4-8 medications and 0 = 0-3 medications) in the descriptive table and as a count measure (number of medications) in the Poisson regression model.

#### Exposure variable

Dizziness was assessed with one question from the Health and Retirement Study on having persistent or troublesome dizziness or light headedness in the past two years (Yes, No) (23).

Covariates consisted of education (none and  $\geq 1$  years), age, sex (male, female), marital status, caste, urban, and rural residence and subjective socioeconomic status (23).

Organizational religiosity was sourced from the item, “In the past year, how often have you attended religious services (at a temple/mosque/church, etc.)?” Response options were grouped into “1 (low) = not at all, 2 (medium) = 1-3 times a month or 1 or more times a year, and 3 (high) = once a week or more than once a week or every day” (23).

Social participation was measured with 6 items, e.g., “Eat-out-of-house (restaurant/hotel)” (33). Responses were coded “1 = daily to at least once a month and 0 = rarely/once a year or never, and social participation was defined as at least one activity” (36).

#### Data analysis

Statistical analyses were conducted with “STATA software version 15.0 (Stata Corporation, College Station, TX, USA),” considering the complex study design. Odds ratios and 95 Confidence Intervals (CI) are presented for logistic regression analyses (binary outcomes), exponential Coefficients and 95% CI for linear regression (scale outcomes), and Incident Risk Ratios and 95% CI for Poisson regression analyses (count outcomes). The first model (Model 1) is unadjusted, and in adjusted model (Model 2), adjustments were made for social participation, sex, age, marital, residence and subjective socioeconomic status, education, and organised religiosity, and all health

indicators assessed in this study. Missing values were discarded, and p-values of below 0.05 were considered as significant.

#### Ethical considerations

The study was approved by the “Indian Council of Medical Research (ICMR) Ethics Committee and written or oral informed consent was obtained from the participants.”

## Results

#### Sample characteristics

The sample included 72,262 individuals aged 45 years and older. More than one in seven participants (13.7 %) reported persistent or troublesome dizziness or light headedness in the past two years. Further sample and health indicator characteristics are shown in table 1.

#### Associations with dizziness and health indicators

In adjusted logistic, linear and Poisson regression analyses, dizziness was associated with worse self-rated health status, lower life satisfaction, major depressive disorder, insomnia symptoms and severe fatigue. Regarding physical health, dizziness increased the odds of pain conditions, cardiovascular conditions, chronic lung disease, functional limitations, fall history, hearing loss, impaired vision, and higher number of medications currently used. In addition, in the unadjusted analysis, dizziness was negatively associated with cognitive functioning. (Table 2)

## Discussion

To our knowledge, this study is the first to assess the associations of dizziness with various poor mental and physical health outcomes among middle-aged and older adults in a national community-based sample in India in 2017-2018. We found that dizziness was associated with six poor mental health outcomes (worse self-rated health status, lower life satisfaction, major depressive disorder, insomnia symptoms and severe fatigue) and eight poor physical health outcomes (pain conditions, cardiovascular conditions, chronic lung disease, functional limitations, fall history, hearing loss, impaired vision and higher number of medications currently used).

The association between dizziness and poor mental health outcomes has been found in various previous studies (7-13). In a previous review (11), dizziness was found associated with cognitive impairment, while in this study we only found an inverse association between dizziness and cognitive functioning in unadjusted analysis. “Vertigo can trigger or exacerbate psychiatric problems, which do not necessarily correlate with deficits on neurologic testing.” (37). “Development of anxiety or depressive disorder after the onset of the vestibular disorder is correlated with poor improvement and high persistency of vertigo and dizziness.” (38). Moreover, the coexistence of mental and/or insomnia problems can increase the impact of dizziness on everyday life and reduce quality of life (39). Since this was a cross-sectional study, we cannot determine the direction of the relationship between dizziness and poor mental health. It is also possible that poor mental health precipitates dizziness. For example, fatigue has been found

as a precipitant of dizziness (13) or a secondary problem to vestibular pathology (40), or dizziness can be both a cause and a symptom of psychological problems (41).

Table 1. Sample characteristics among middle-aged and older adults in India, 2017-2018 (N=72262)

Variable	Sub-category	Sample % or M (SD)	Dizziness % or M (SD)
<b>Social and demographic factors</b>			
<b>Age in years</b>	45-59	54.1	13.1
	60 or more	45.9	14.5
<b>Sex</b>	Female	58.0	16.3
	Male	42.0	10.1
<b>Education</b>	≥ 1 years schooling	50.5	11.1
	No schooling	49.5	16.4
<b>Subjective socioeconomic status</b>	Low	37.2	16.6
	Medium	38.7	13.8
	High	24.1	9.5
<b>Marital status</b>	Not married	24.4	14.5
	Married	75.6	13.5
<b>Caste/tribe</b>	None of the below	24.9	12.6
	Scheduled caste	19.7	15.4
	Scheduled tribe	8.8	18.1
	Other backward class	46.7	12.7
<b>Residence</b>	Rural	68.2	15.4
	Urban	31.8	19.2
<b>Religious service</b>	Not at all	25.5	12.2
	1-3 times/month or ≥ 1 times/year	46.9	14.5
	≥ 1/week or every day	27.6	14.0
<b>Social participation</b>	Yes	54.4	13.3
<b>Mental health</b>			
<b>Self-rated health</b>	Scale (1-5): M (SD)	2.8 (1.0)	2.4 (1.0)
<b>Life satisfaction</b>	Scale (5-35): M (SD)	23.7 (7.5)	22.2 (7.5)
<b>Cognitive functioning</b>	Scale (0-32): M (SD)	18.7 (5.1)	17.6 (5.0)
<b>Major depressive disorder</b>	Yes	7.6	25.6
<b>Insomnia symptoms</b>	Yes	12.7	26.3
<b>Severe fatigue</b>	Yes	21.7	31.8
<b>Physical health</b>			
<b>Any pain conditions</b>	1 or more	65.7	18.5
<b>Back pain or problem</b>	Yes	31.5	23.5
<b>Persistent headaches</b>	Yes	12.8	34.5
<b>Painful teeth</b>	Yes	28.4	20.7
<b>Pain or stiffness of joints</b>	Yes	46.1	19.5
<b>Any cardiovascular conditions</b>	1 or more	46.6	15.6
<b>Hypertension</b>	Yes	40.4	14.3
<b>Angina</b>	Yes	8.6	25.4
<b>Heart disease</b>	Yes	3.6	20.6
<b>Stoke</b>	Yes	1.8	20.0
<b>Chronic lung disease</b>	Yes	6.3	20.5
<b>Functional limitations</b>	2 or more	28.8	20.1
<b>Fall past 2 years</b>	Yes	11.1	22.7
<b>Hearing loss</b>	Yes	6.6	19.9
<b>Impaired vision</b>	Yes	8.7	23.6
<b>Medication use</b>			
<b>Number of medications using</b>	4-8	1.3	25.2

Table 2. Associations between dizziness and health indicators

Outcome variables	Dizziness	Model 1: unadjusted odds ratio or IRR or exp (Coef.) (95% CI)	Model 2: adjusted odds ratio or IRR or exp (Coef.) (95% CI) <sup>a</sup>
<b>Mental health</b>			
<b>Self-rated health status</b>	Count	0.84 (0.83, 0.86)***	0.93 (0.92, 0.95)***
<b>Life satisfaction</b>	Scale	0.19 (0.13, 0.28)***	0.49 (0.33, 0.71)***
<b>Cognitive functioning</b>	Scale	0.30 (0.24, 0.39)***	0.87 (0.72, 1.04)
<b>Major depressive disorder</b>	No	1 Reference	1 Reference
	Yes	2.35 (2.06, 2.68)***	1.63 (1.42, 1.68)***
<b>Insomnia symptoms</b>	No	1 Reference	1 Reference
	Yes	2.63 (2.41, 2.88)***	2.03 (1.85, 2.23)***
<b>Severe fatigue</b>	No	1 Reference	1 Reference
	Yes	4.89 (4.43, 5.43)***	3.57 (3.27, 3.90)***
<b>Physical health</b>			
<b>Number of pain conditions</b>	Count	1 Reference	1 Reference
		1.82 (1.75, 1.89)***	1.38 (1.34, 1.42)***
<b>Number of cardiovascular conditions</b>	Count	1 Reference	1 Reference
		1.24 (1.18, 1.30)***	1.13 (1.09, 1.17)***
<b>Chronic lung disease</b>	No	1 Reference	1 Reference
	Yes	1.68 (1.41, 2.02)***	1.61 (1.38, 1.90)***
<b>Functional limitations</b>	No	1 Reference	1 Reference
	Yes	2.01 (1.85, 2.18)***	1.55 (1.43, 1.69)***
<b>Fall past 2 years</b>	No	1 Reference	1 Reference
	Yes	2.25 (2.00, 2.13)***	1.89 (1.69, 2.12)***
<b>Hearing loss</b>	No	1 Reference	1 Reference
	Yes	1.62 (1.43, 1.83)***	1.45 (1.27, 1.85)***
<b>Impaired vision</b>	No	1 Reference	1 Reference
	Yes	2.11 (1.83, 2.42)***	1.61 (1.38, 1.90)***
<b>Medication use</b>			
<b>Number of medications used</b>	Count	1 Reference	1 Reference
		1.19 (1.16, 1.22)***	1.10 (1.07, 1.12)***

<sup>a</sup>Adjusted for age group, sex, education, marital status, subjective socioeconomic status, area of residence, and all variables in the Table; \*\*\* $p < 0.001$ ; \*\* $p < 0.01$ ; \* $p < 0.05$ ; Exp (Coef.): Exponential Coefficient; IRR: Incident Risk Ratio

Consistent with previous research (12, 14–16), this study found an association between dizziness and various physical health conditions, including pain conditions, cardiovascular issues, chronic lung disease and polypharmacy. Musculoskeletal pain may be a secondary symptom to dizziness and disequilibrium (12). Dizziness may be because of side effects of medication use (12). Findings suggest that dizziness may be one of several somatic problems that are commonly related (8, 42).

Furthermore, in line with previous findings (7–9, 15, 19, 21), this study showed that dizziness increased the odds of hearing loss, impaired vision, functional disability and falls. This suggests that dizziness may be related to common mechanisms with hearing loss and tinnitus (8, 41). The finding that dizzy persons fall more often has implications for fall prevention, such as early diagnosis of balance problems (7). It is also possible that dizziness is comorbid with multiple factors, such as psychological and sensory problems (9, 43), supporting the view of a multifactorial cause or multi-comorbidity of dizziness (43). In this case, a multifactorial intervention might be indicated in reducing dizziness in middle-age and older

persons (8). Such interventions could focus on treatable disabling factors resulting from dizziness, such as mental problems. A systematic review found some evidence that “psychotherapy may be effective in patients with dizziness that is medically not sufficiently explained or due to a psychiatric disorder.” (44).

## Conclusions

Dizziness was associated with six poor mental health and eight poor physical health outcomes. Findings support multidimensional management of dizziness in the general population.

## Study limitations

Some of the variables were assessed by self-report, which may have biased responses. Due to the cross-sectional study design, we cannot make causative conclusions on the relationship between dizziness and health outcome indicators. Dizziness was only assessed with one item and did not include the type of dizziness.



Future research should include multiple item measures of dizziness, including different dimensions of dizziness.

### Conflict of interest

The authors declare that they have no competing interests.

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### Authors' contributions

"All authors fulfill the criteria for authorship. SP and KP conceived and designed the research, performed statistical analysis, drafted the manuscript, and made critical revisions of the manuscript for key intellectual content. All authors read and approved the final version of the manuscript and have agreed to the authorship and order of authorship for this manuscript."

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