



BMJ Open is committed to open peer review. As part of this commitment we make the peer review history of every article we publish publicly available.

When an article is published we post the peer reviewers' comments and the authors' responses online. We also post the versions of the paper that were used during peer review. These are the versions that the peer review comments apply to.

The versions of the paper that follow are the versions that were submitted during the peer review process. They are not the versions of record or the final published versions. They should not be cited or distributed as the published version of this manuscript.

BMJ Open is an open access journal and the full, final, typeset and author-corrected version of record of the manuscript is available on our site with no access controls, subscription charges or pay-per-view fees (<http://bmjopen.bmj.com>).

If you have any questions on BMJ Open's open peer review process please email [info.bmjopen@bmj.com](mailto:info.bmjopen@bmj.com)

# BMJ Open

## DEPRESSION AMONG PEOPLE WITH DISABILITIES: A CROSS-SECTIONAL COMMUNITY-BASED STUDY IN NEPAL

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2023-082955
Article Type:	Original research
Date Submitted by the Author:	07-Dec-2023
Complete List of Authors:	Mishra, Durga Kumari Khadka; Manmohan Memorial Institute of Health Sciences, Department of Public Health Ghimire, Apekshya; Manmohan Memorial Institute of Health Sciences, Department of Public Health
Keywords:	PUBLIC HEALTH, MENTAL HEALTH, Depression & mood disorders < PSYCHIATRY

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies. Enseignement Supérieur (ABES).

# DEPRESSION AMONG PEOPLE WITH DISABILITIES: A CROSS-SECTIONAL COMMUNITY-BASED STUDY IN NEPAL

Durga Khadka Mishra<sup>1</sup>, Apekshya Ghimire<sup>1</sup> (0000-0001-7883-0141)

<sup>1</sup>Department of Public Health, Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal

Corresponding to: Apekshya Ghimire

Apekshyaghimire9@gmail.com

For peer review only

Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies.

BMJ Open: first published as 10.1136/bmjopen-2023-082955 on 25 February 2025. Downloaded from <http://bmjopen.bmj.com/> on June 9, 2025 at Agence Bibliographique de l'Enseignement Supérieur (ABES).

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

# ABSTRACT

## Objective

To assess the prevalence of depression among people with disabilities and its associated factors.

## Design

A cross-sectional study was done using the quantitative research method.

## Setting

Community-based, Ilam Municipality, Nepal

## Participants

The study was conducted among 164 people with physical, hearing and vision-related disabilities of Ilam municipality, Nepal. Participants were drawn by simple random sampling method using the sampling frame obtained from Ilam municipality.

## Main outcome measure

Depression and its associated factors among people with disabilities by using a validated Nepali version of Hospital Anxiety and Depression Scale (HADS-D) and a pre-tested semi-structured questionnaire.

## Results

The prevalence of depression was 39% among people with disabilities and 29.9 % of the respondents were in borderline depression. Age, sex, educational level, employment status, economic status, involvement in social activities, physical activity, satisfaction with life, suicidal

thoughts, level of disability, time of disability, reported co-morbidity and treatment are associated with depression.

## Conclusion

The high prevalence of depression among people with disabilities is a major public health challenge affecting a greater number of vulnerable people. It needs our attention and warrants strategic planning and implementation ensuring prevention of disease, promotion and protection of health and well-being of vulnerable groups.

## Key words

People with disabilities, physical disabilities, hard of hearing, vision related disabilities, Depression

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

## Introduction

Disability means a lack of ability or restriction in the performance of an activity because of impairment. These activities can be interpersonal relations, work, physical activities, mental or intellectual (1). Disability is increasing, emerging as a public health challenge affecting a greater number of people every year. In 2019, over one billion people in the world had some form of disability. This number is expected to double to 2 billion by 2050 (2,3). This increasing burden is attributed to the increased prevalence of non-communicable diseases along with genetic causes, complications during childbirth, problems in early diagnosis, and treatment of underlying conditions leading to disability. This study uses “disability” as an umbrella term for impairments, activity limitations, and participation restrictions among people with physical, visual, and hearing impairments.

Everybody is likely to experience some form of disability at some point in their life, more likely as people age (3). Even though disability is widespread, people with disabilities still experience stigmatization, discrimination, inequalities, and participation restrictions. Their rights and dignity are violated, through acts of violence, abuse, and disrespect and these barriers they face are avoidable (3). The emotional disturbance of these disabled individuals further predisposes and reinforces the development of mental disorders (3,4).

Depression is one of the common mental disorders characterized by persistent sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, tiredness, and poor concentration (2,5). People with disabilities are three times more likely to have depression as compared to general population (6). Globally, an estimated 322 million people are living with depression (2). Depression is one of the leading causes of disability worldwide and is found to be

directly associated with an individual's quality of life (7,8). Depression as well as disability in our society is highly stigmatized (6,9). In 2014, a study in Pakistan among permanently disabled people showed that 42.86% had moderate depression, 37.14% had severe depression and 14.29% had extreme depression (10). Likewise, many studies on depression and physical illness showed a positive correlation between depression and physical disability (11,12). A recent study on “Self-esteem, anxiety and depression among physically disabled people” in India showed a higher score of depression among people with disability (18.5) than that of the general population (7.2) (4).

The study on depression among disabled people is limited, especially in the context of Nepal. Given the influence of disability on mental health, this study helps to find the current status of depression among people with disabilities and associated factors in the selected Municipality of Nepal. This study will provide a basis for designing various mental health intervention programs for people with disabilities and will assist policymakers and program planners to address mental health issues of people with disabilities.

## Methods

### Study population

A community-based cross-sectional study was conducted among 164 people with disabilities in Ilam Municipality of Province 1, Nepal. Quantitative research method was used in the study. Study unit was individual.

The sample size was determined using the formula for finite population developed by Cochran in 1963 which is

$$n = \frac{Z^2 pq}{d^2 + \frac{Z^2 pq}{N}}$$



Where,

n = desired sample size

Z = standard normal deviate, usually set at 1.96 which correspond to 95% Confidence level

p = proportion of target population estimated to have a particular characteristic. Since, the prevalence of anxiety and depression among people with disabilities in context of Nepal and similar characteristic region was not available. Here, p = 0.5 or 50%.

q = 1-p

N = 243 (People with physical disabilities, hard of hearing and vision related disabilities obtained from Ilam municipality)

d = degree of accuracy required, usually set at 0.05 or 5%

Therefore,

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2 + \frac{(1.96)^2 \times 0.5 \times 0.5}{243}}$$

n = 149

Considering 10% non- response rate, the final sample size was

149+ 10% of 149

= 164

Simple random sampling, lottery method was used as sampling technique. A sampling frame of 243 people at the municipality level was obtained from the health section of the Ilam Municipality office. People of the age group 18-65 were included in the study while those who were unable to

complete the survey because of communication difficulties were excluded from the study. Inclusion criteria were confirmed through the municipality record.

A pre-tested structured questionnaire was used to assess the socio-demographic characteristics and depression was measured by using a validated Nepali version of the Hospital Anxiety and Depression Scale (HADS) (13).

### Operational definition

In this study, people with disabilities are defined as people with physical disabilities, hard of hearing and vision-related disabilities. A cut-off value of HADS-D score 11 was used for assessing depression. A score of 11 or more was identified as Depression; 7-10 was identified as borderline depression and less than 7 was identified as Normal (13). Disability was classified as Very Severe (Profound), Severe, Moderate, and Mild, as per the Nepal Law Commission. The classification states Profound disability is a condition where a person has difficulty performing their day-to-day activities even with continuous support of others. Severe disability is defined as a condition where people need continuous support from others to perform personal activities and to participate in social activities. Moderate disability is defined as a condition where a person can regularly participate in their daily activities and in social activities if physical facility is available, environmental barrier is ended or education or training is provided. Mild disability is defined as a condition where a person can regularly participate in their daily activities and social activities if there exists no physical and environmental barrier.

### Pre-testing

Pre-testing was done in Mahalaxmi municipality among 20 people with disabilities. Content and face validity was maintained through extensive literature review and consultation with experts.

1

2

3 **Data analysis**

4

5

6 We entered and analyzed the data in Statistical Package for Social Science (SPSS IBM v. 22).

7

8 Descriptive analysis for all variables was presented in the form of frequency and percentage. Chi-

9

10 square test (at 5% level of significance and 95% CI) was used to assess the association between

11

12 dependent and independent variables.

13

14

15

16 **Patient and public involvement**

17

18

19 Patient and public were involved the design of study tools. During the initial phase of the study

20

21 representative people with disabilities from National Federation of the Disabled Nepal were

22

23 consulted and their suggestions were incorporated in the study. After publication, the findings from

24

25 the study will be disseminated with people with disabilities and organizations working for assisting

26

27 them.

28

29

30

31 **Results**

32

33

34 Table 1 shows the socio-demographic characteristics of the respondents. The mean age of the

35

36 participants was 38.37 ± 15.75 years with majority of them (57.9%) male. Majority (55.5%) were

37

38 unmarried and 51.2% below poverty. Majority (66.5%) of the respondents experienced violence.

39

40 Emotional and mental violence was mostly reported type of violence. Majority (62.2% and 58.5%)

41

42 are not using any assistive device and treatment respectively.

43

44

45

46 Table 1: Socio-demographic characteristics of the respondents (n=164)

47

48

49

Variables	Frequency	Percentage
<b>Age</b>		
Mean ± SD	38.37 ± 15.75	

50

51

52

53

54

55

56

Range	18-65	
15-35	82	50
35-55	50	30.5
55 and above	32	19.5
<b>Sex</b>		
Male	95	57.9
Female	69	42.1
<b>Marital status</b>		
Unmarried	91	55.5
Married	73	44.5
<b>Family type</b>		
Nuclear	68	41.5
Joint	96	58.5
<b>Education status</b>		
Illiterate	52	31.7
Literate	37	22.6
Formal education	75	45.7
<b>Employment</b>		
Unemployed	63	38.4
Employed	29	17.7
Housemakers	26	15.8
Students	19	11.6
Agriculture	27	16.5

<b>Economic status</b>		
Below poverty	84	51.2
Above poverty	80	48.7
<b>Experience of violence</b>		
Yes	109	66.5
No	55	33.5
<b>Types of violence (109)*</b>		
Physical	20	21.1
Sexual	6	6.3
Mental	89	93.7
Emotional	94	98.9
Deprivation	54	20.5
<b>Involvement in social function</b>		
Almost every function	26	15.9
Sometimes	72	43.9
Never	66	40.2
<b>Assistive device</b>		
Yes	62	37.8
No	102	62.2

\*=multiple responses recorded

Table 2 shows the biological and behavioral characteristics of the respondents. Most (68.9%) of the respondents were with physical disabilities. Hypertension was mostly reported as co-morbidity

and most (38.4%) of the respondents never do any sorts of physical activity. Majority (69.5%) of the respondents were not satisfied with their life and almost half (49.4%) of the respondents had suicidal ideation.

Table 2: Biological and behavioral characteristics of the respondents

Variables	Frequency	Percentage
<b>Type of disability</b>		
Physical	113	68.9
Vision	27	16.5
Hard of hearing	24	14.6
<b>Level of disability</b>		
Very severe	18	11
Severe	55	35.5
Moderate	61	35.5
Mild	30	18.3
<b>Duration of disability</b>		
After birth	82	50
By Birth	82	50
<b>Reported co-morbidity</b>		
Yes	39	23.8
No	125	76.2
<b>Disease (n=39) *</b>		
HTN	21	53.8

Diabetes	9	17.6
Cancer	3	5.9
Others	18	35.3
<b>Treatment received for co-morbidity</b>		
Yes	68	41.5
No	96	58.5
<b>Physical activity</b>		
Never	63	38.4
Sometimes	47	28.7
Regular	54	32.9
<b>Substance abuse</b>		
Yes	47	28.7
No	117	71.3
<b>Types of substance abuse</b>		
Alcohol	19	40.4
Smoking	46	97.9
Other	2	4.2
<b>Stressful life events</b>		
Yes	32	19.5
No	132	80.5
<b>Satisfaction with life</b>		
Yes	50	30.5

No	114	69.5
<b>Suicidal ideation</b>		
Yes	81	49.4
No	83	50.6
<b>Suicidal attempts</b>		
Yes	14	8.5
No	150	91.5

\*=multiple responses recorded

Table 3 shows depression among the respondents. About 39% of the respondents had depression and 29.9% were in borderline depression. While, only 31.1% of the respondents were normal.

Table 3: Depression among the respondents (n=164)

Variables	Frequency	Percentage
<b>Prevalence of depression</b>		
Depression	64	39
No Depression	100	61
<b>Level of depression</b>		
Depression	64	39
Borderline	49	29.9
Normal	51	31.1

Association between socio-demographic factors and depression is shown in table 4. Age (p=0.001), sex (0.009), education status (p<0.001), employment (p<0.001), economic status



(p<0.001) are found to be associated with depression. Experience of violence (p=0.001) and Involvement in societal function (p<0.001) are found to be significantly associated with depression.

Table 4: Association of socio-demographic factors with depression (n=164)

Variables	Depression (%)	No Depression (%)	P-value
Age			
16-35	23 (28%)	59 (72%)	0.001
36-55	19 (38.8%)	30 (61.2%)	
55 and above	22 (66.7%)	11 (33.3%)	
Sex			
Male	29 (30.5%)	66 (69.5%)	0.009
Female	35 (50.7%)	34 (49.3%)	
Marital status			
Married	35 (47.9%)	38 (52.1%)	0.36
Unmarried	29 (31.9%)	62 (68.1%)	
Family type			
Nuclear	27 (39.7%)	41 (60.3%)	0.88
Joint	37 (38.5%)	59 (61.5%)	
Education status			
Illiterate	33 (63.5%)	19 (36.5%)	<0.001
Literate	17 (45.9%)	20 (54.1%)	
Formal education	14 (18.7%)	61 (81.3%)	

Employment			
Unemployed	32 (50.8%)	31 (49.2%)	< 0.001
Employed	7 (24.1%)	22 (75.9%)	
Housemakers	17 (65.4%)	9 (34.6%)	
Students	2 (10.5%)	17 (89.5%)	
Agriculture	6 (22.2%)	21 (77.8%)	
Economic status			
Below poverty	50 (59.5%)	34 (40.5%)	< 0.001
Above poverty	14 (17.5%)	66 (82.5%)	
Experience of violence			
Yes	52 (47.7%)	57 (52.3%)	0.001
No	12 (21.8%)	43 (78.2%)	
Involvement in social function			
Almost every function	3 (11.5%)	23 (88.5%)	<0.001
Sometimes	22 (30.6%)	50 (69.4%)	
Never	39 (59.1%)	27 (40.9%)	
Assistive device			
Yes	24 (38.7%)	38 (61.3%)	0.949
No	40 (39.2%)	62 (60.8%)	

Association of biological and behavioral factors with depression is shown in table 5. Level of disability ( $p<0.001$ ), reported co-morbidity ( $p=0.030$ ), treatment received for co-morbidity conditions ( $p=0.010$ ), physical activity ( $p=0.001$ ), satisfaction with life ( $p<0.001$ ) and suicidal ideation ( $p<0.001$ ) are found to be significantly associated with depression.

Table 5: Association of biological and behavioral factors with depression (n= 164)

Variables	Depression (%)	No Depression (%)	P-value
Type of disability			
Physical	50 (44.2%)	63 (55.8%)	0.121
Vision	7 (25.9%)	20 (74.1%)	
Hard of hearing	7 (29.2%)	17 (74.1%)	
Level of disability			
Very severe	14 (77.8%)	4 (22.2%)	< 0.001
Severe	18 (32.7%)	37 (67.3%)	
Moderate	27 (44.3%)	34 (55.7%)	
Mild	5 (16.7%)	25 (83.3%)	
Duration of disability			
After birth	38 (46.3%)	44 (53.7%)	0.055
By Birth	26 (31.7%)	56 (68.3%)	
Reported co-morbidity			
Yes	21(53.8%)	18 (46.2%)	0.030

No	43 (34.4%)	82 (65.6%)	
<b>Treatment received for co-morbidity</b>			
Yes	19 (27.5%)	50 (72.5%)	0.010
No	45 (47.4%)	50 (52.6%)	
<b>Physical activity</b>			
Never	35 (55.6%)	28 (44.4%)	0.001
Sometimes	17 (36.2%)	30 (63.8%)	
Regular	12 (22.2%)	42 (77.8%)	
<b>Substance abuse</b>			
Yes	23 (48.9%)	24 (51.1%)	0.099
No	41 (35%)	76 (65%)	
<b>Stressful life events</b>			
Yes	14 (43.8%)	18 (56.3%)	0.541
No	50 (37.9%)	82 (62.1%)	
<b>Satisfaction with life</b>			
Yes	7 (14%)	43 (86%)	<0.001
No	57 (50%)	57 (50%)	
<b>Suicidal ideation</b>			
Yes	48 (59.3%)	33 (40.7%)	<0.001
No	16 (19.3%)	67 (80.7%)	
<b>Suicidal attempts</b>			
Yes	8 (57.1%)	6 (42.9%)	0.146

No	56 (37.3%)	94 (62.7%)	
----	------------	------------	--

Discussion

This study showed 39% prevalence of depression among people with disability and 29.9% were found to be in borderline depression, higher than the national average (10%) among general population (14). In contrast to this, a hospital-based study conducted on 'Level of Depression in 'Physically Disabled' in Pakistan among 35 permanently disabled patients showed 97% prevalence of depression (10).

This study also showed a significant association of age of the respondent with depression (p=0.001). Similarly study in Iraq also showed a significant association of age and depression (P=0.001)(15) and other few studies by Zaidi, Al-Abbudi and Shen et al. also found age as a strong predictor of depression (15–17).

This study showed significant association between sex and depression with higher prevalence in female than male. In line with the findings from many other studies that showed higher depression scores among females (15–17). Contradicting the findings, another study on 'Factors associated with anxiety and depression' showed no difference between sexes in the prevalence of depression (18). The difference in prevalence might be due to patriarchal society in the study area of this study. While, no statistically significant association of ethnicity, marital status, family type with depression was established in this study.

Present analysis from the study showed higher the education level, the better the employment and economic status of the respondents, lower the prevalence of depression. Whereas, the higher the level of disability, higher the prevalence of depression. Similar to the other studies that observed

education level, occupation, economic status, physical activity, and severity of disability as strong predictors of depression (12,17,18)

Physically active, socially involved respondents and those who are not satisfied with their life are found to be significantly associated with depression. Similarly, studies by Okoro et.al. and another population-based study on mobility limitation also showed significant association of physical inactivity with depression among the respondents with disabilities (19,20). In this study, higher prevalence of depression was among those who never do physical exercise. Similar findings from a study by De Mello et al. was observed. People who do not practice regular physical exercise are 2 times more likely to get depression (21). Also, presence of other reported NCDs and treatment accessibility also influenced their mental health status of the respondents.

Reported NCDs like HTN, Cancer, diabetes in respondents and treatment accessibility were found to be significantly associated with depression, similar to another study by Shen et.al 2017(17). The Lancet in 2012, concluded that violence is a major problem in adults with disabilities. High prevalence of violence, 66.5% among people with disability with a statistically significant association with depression was observed in this study. Likewise, a few other studies by Olofsson et al. 2014, Monteso. 2017 and Hughes et al. als found higher prevalence of violence among people with disability(22–24). In a study in a community sample, no or low social support was established as a predictive factor for depression. This study is inline with the finding where, respondents with better involvement in social function showed less depression (17).

Several studies have established depression as a major risk factor for suicide (26). In this study, we observed 49.4% of the respondent have a thought of suicide and 8.5% had attempted. This is significantly higher than reported in a study by Nosek et. al, which showed 20% prevalence of

suicidal ideation(25). The difference may be attributed by the factor that the study was conducted only female in a different socio-cultural setting.

**Conclusion**

The study showed, out of 164 people with disabilities of Ilam municipality, 39% of the respondents had depression and about one third participants were in borderline depression. The study identified Age, sex, educational level, employment status, economic status, involvement in social activities, physical activity, satisfaction with life, suicidal thoughts, level of disability, time of disability, reported co-morbidity and treatment as factors contributing to depression. Therefore, these factors need to be considered for better health and well-being and for preventing depression among people with disabilities.

**Strength and Limitation of the Study**

This study explored the least explored and stigmatized matter of depression among people with disabilities. To the best of our knowledge, such type of community-based studies focusing mental health of people with disabilities are limited in context of Nepal. This study highlighted high prevalence of depression among people with acquired disability in Nepal. While, the study was conducted among the listed people with disabilities as per the data from the Ilam municipality, this study leaves those people with disabilities who are not listed. A large-scale study on mental health of people with disabilities is recommended to grab a globally representative scenario.

**Ethical approval**

Ethical approval was obtained from the institutional review committee of Manmohan Memorial Institute of Health Sciences, Kathmandu Nepal; MMIHS IRC 320. Informed written consent was taken from each participant after explaining the objective of the study.

### **Data Availability**

Additional data can be provided upon request to the corresponding author.

### **Funding**

This study has not been financially supported by any organization.

### **Conflict of Interest**

The authors declare that there is no conflict of interest regarding the publication of this paper.

### **Author Statement**

Apekshya Ghimire: Proposal development, tools development, data collection, data entry, data analysis, writing, manuscript preparation

Durga Khadka Mishra: proposal development, tools development, manuscript preparation, supervision

### **Acknowledgments**

We would like to acknowledge all the participants of this study and Ilam municipality and Karuna Foundation Nepal for their support. We would like to heartily thank all the faculty members of the Department of Public Health, Manmohan Memorial Institute of Health Sciences



References

1. World Health Organization. International classification of impairments, disabilities, and handicaps : a manual of classification relating to the consequences of disease, published in accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, May 1976 [Internet]. World Health Organization; 1980 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/41003>

2. World Health Organization. WHO EMRO | Depression: Let’s talk | World Health Day 2017 | World Health Days [Internet]. [cited 2021 Jun 14]. Available from: <http://www.emro.who.int/world-health-days/world-health-day-2017/depression-lets-talk.html>

3. World Health Organization. WHO global disability action plan 2014-2021: better health for all people with disability [Internet]. World Health Organization; 2015 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/199544>

4. Mushtaq S, Akhouri D. Self esteem, anxiety, depression and stress among physically disabled people. Int J Indian Psychol. 2016;3(4):64.

5. World Health Organization. Depression and other common mental disorders: global health estimates. 2017. Available from: <https://apps.who.int/iris/handle/10665/254610>

6. Noh J-W, Kwon YD, Park J, Oh I-H, Kim J. Relationship between Physical Disability and Depression by Gender: A Panel Regression Model. PLOS ONE. 2016 Nov 30;11(11):e0166238.

7. Hollon SD, Cohen ZD, Singla DR, Andrews PW. Recent Developments in the Treatment of Depression. Behav Ther. 2019 Mar;50(2):257–69.

8. Bradley SM, Rumsfeld JS. Depression and cardiovascular disease. *Trends Cardiovasc Med*. 2015 Oct;25(7):614–22.
9. Yokoya S, Maeno T, Sakamoto N, Goto R, Maeno T. A Brief Survey of Public Knowledge and Stigma Towards Depression. *J Clin Med Res*. 2018 Mar;10(3):202–9.
10. Hussain N, Sikander M, Maqsood M. Level of Depression in Physically Disabled. 2014;5.
11. Aneshensel CS, Frerichs RR, Huba GJ. Depression and Physical Illness: A Multiwave, Nonrecursive Causal Model. *J Health Soc Behav*. 1984;25(4):350–71.
12. Jones KH, Jones PA, Middleton RM, Ford DV, Tuite-Dalton K, Lockhart-Jones H, et al. Physical Disability, Anxiety and Depression in People with MS: An Internet-Based Survey via the UK MS Register. *PLoS ONE*. 2014 Aug 25;9(8):e104604.
13. Risal A, Manandhar K, Linde M, Koju R, Steiner TJ, Holen A. Reliability and Validity of a Nepali-language Version of the Hospital Anxiety and Depression Scale (HADS). *Kathmandu Univ Med J KUMJ*. 2015 Jun;13(50):115–24.
14. Jha A, Ojha S. National Mental Health Survey, Nepal. *Journal of Nepal Health Research Council*. 2020; 28;46-28
15. Al-Abbudi S, Ezzat K, Zebala A, Hamdy D, Beedany M, Farhan M. Prevalence and Determinants of Depression Among Traumatic Spinal Cord Injured Patients Attending Ibn-Al-Quff Hospital, Baghdad, Iraq. *J Psychiatry*. 2017 Jan 1;20.
16. Zaidi SM. Comorbidity of Physical Disability with Depression and Anxiety. *Int J Environ Ecol Fam Urban Stud IJEEFUS*. 2013 Mar 30;3:79–86.

17. Shen S-C, Huang K-H, Kung P-T, Chiu L-T, Tsai W-C. Incidence, risk, and associated factors of depression in adults with physical and sensory disabilities: A nationwide population-based study. *PLoS ONE*. 2017 Mar 31;12(3):e0175141.

18. Gale CR, Sayer AA, Cooper C, Dennison EM, Starr JM, Whalley LJ, et al. Factors associated with symptoms of anxiety and depression in five cohorts of community-based older people: the HALCYon (Healthy Ageing across the Life Course) Programme. *Psychol Med*. 2011 Oct;41(10):2057–73.

19. Okoro CA, Strine TW, Balluz LS, Crews JE, Mokdad AH. Prevalence and correlates of depressive symptoms among United States adults with disabilities using assistive technology. *Prev Med*. 2010 Apr;50(4):204–9.

20. Rask S, Castaneda AE, Koponen P, Sainio P, Stenholm S, Suvisaari J, et al. The association between mental health symptoms and mobility limitation among Russian, Somali and Kurdish migrants: a population based study. *BMC Public Health*. 2015 Mar 20;15:275.

21. De Mello MT, Lemos V de A, Antunes HKM, Bittencourt L, Santos-Silva R, Tufik S. Relationship between physical activity and depression and anxiety symptoms: a population study. *J Affect Disord*. 2013 Jul;149(1–3):241–6.

22. Montesó-Curto P, Aguilar C, Lejeune M, Casadó-Marin L, Casanova Garrigós G, Ferré-Grau C. Violence and depression in a community sample. *J Clin Nurs*. 2017 Aug;26(15–16):2392–8.

23. Olofsson N, Lindqvist K, Danielsson I. Higher risk of violence exposure in men and women with physical or sensory disabilities: results from a public health survey. *J Interpers Violence*. 2015 Jun;30(10):1671–86.

24. Hughes K, Bellis MA, Jones L, Wood S, Bates G, Eckley L, et al. Prevalence and risk of violence against adults with disabilities: a systematic review and meta-analysis of observational studies. *Lancet Lond Engl*. 2012 Apr 28;379(9826):1621–9.
25. Nosek MA, Hughes RB, Robinson-Whelen S. The complex array of antecedents of depression in women with physical disabilities: implications for clinicians. *Disabil Rehabil*. 2008;30(3):174–83.
26. Choi SB, Lee W, Yoon J-H, Won J-U, Kim DW. Risk factors of suicide attempt among people with suicidal ideation in South Korea: a cross-sectional study. *BMC Public Health*. 2017 Dec;17(1):579.

# BMJ Open

## Depression among people with disabilities: a community-based, cross-sectional study in Nepal

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2023-082955.R1
Article Type:	Original research
Date Submitted by the Author:	17-Oct-2024
Complete List of Authors:	Mishra, Durga Kumari Khadka; Manmohan Memorial Institute of Health Sciences, Department of Public Health Ghimire, Apekshya; Manmohan Memorial Institute of Health Sciences, Department of Public Health
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Public health, Mental health
Keywords:	PUBLIC HEALTH, MENTAL HEALTH, Depression & mood disorders < PSYCHIATRY

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies. Enseignement Supérieur (ABES).

# Depression among people with disabilities: a community-based, cross-sectional study in Nepal

Durga Khadka Mishra<sup>1</sup>, Apekshya Ghimire<sup>1</sup> (0000-0001-7883-0141)

<sup>1</sup>Department of Public Health, Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal

Corresponding to: Apekshya Ghimire

Apekshyaghimire9@gmail.com

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

# ABSTRACT

## Objective

To assess the prevalence of depression among people with disabilities and its associated factors.

## Design

A cross-sectional study was done using the quantitative research method.

## Setting

Community-based, Ilam Municipality, Nepal was conducted from October-November 2019.

## Participants

The study was conducted among 164 people with physical, hearing and vision-related disabilities of Ilam municipality, Nepal. Participants were drawn by simple random sampling method using the sampling frame obtained from Ilam municipality.

## Main outcome measure

Depression and its associated factors among people with disabilities by using a validated Nepali version of Hospital Anxiety and Depression Scale (HADS-D) and a pre-tested semi-structured questionnaire.



## Results

The prevalence of depression was 39% among people with disabilities and 29.9 % of the respondents were in borderline depression. Age (OR = 4.8, CI: 1.7 – 13.5), sex (OR = 2.9, CI: 1.3 – 6.4), economic status (OR = 0.227, CI: 0.09 – 0.54), involvement in social activities (OR = 0.40, CI: 0.18 – 0.88), suicidal ideation (OR = 2.7, CI: 1.2 – 6.0), and treatment accessibility (OR = 0.347, CI: 0.14 – 0.8) are associated with depression among people with disabilities.

## Conclusion

Depression is one of the major global public health concern, and people with disabilities are more vulnerable. . It needs our attention and warrants strategic planning and implementation ensuring prevention of disease, promotion and protection of health and well-being of vulnerable groups.

## Key words

People with disabilities, physical disabilities, hard of hearing, vision related disabilities, Depression

## Strengths and Limitations of the Study

- It is a community-based study including people with different types of disabilities.
- This study has no comparison group.

- The study was conducted among the listed people with disabilities as per the data from the Ilam municipality, this study does not cover those people with disabilities who are not listed.

## Introduction

Disability means a lack of ability or restriction in the performance of an activity because of impairment. These activities can be interpersonal relations, work, physical activities, mental or intellectual [1]. Disability is increasing, emerging as a public health challenge affecting a greater number of people every year. In 2023, estimated 1.3 billion people (16% of the whole world population) had severe disability [2]. This increasing burden is attributed to the increased prevalence of non-communicable diseases along with genetic causes, complications during childbirth, problems in early diagnosis, and treatment of underlying conditions leading to disability. This study uses “disability” as an umbrella term for impairments, activity limitations, and participation restrictions among people with physical, visual, and hearing impairments.

Everybody is likely to experience some form of disability at some point in their life, more likely as people age [3]. Even though disability is widespread, people with disabilities still experience stigmatization, discrimination, inequalities, and participation restrictions. Their rights and dignity are violated, through acts of violence, abuse, and disrespect and these barriers they face are avoidable [3]. The emotional disturbance of these disabled individuals further predisposes and reinforces the development of mental disorders [3,4].

Depression is one of the common mental disorders characterized by persistent sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, tiredness, and

poor concentration [5,6]. People with disabilities are three times more likely to have depression as compared to general population [7]. Globally, an estimated 322 million people are living with depression [5]. Depression is one of the leading causes of disability worldwide and is found to be directly associated with an individual's quality of life [8,9]. Depression as well as disability in our society is highly stigmatized [7,10]. In 2014, a study in Pakistan among permanently disabled people showed that 42.86% had moderate depression, 37.14% had severe depression and 14.29% had extreme depression [10]. Likewise, many studies on depression and physical illness showed a positive correlation between depression and physical disability [11,12]. A recent study on “Self-esteem, anxiety and depression among physically disabled people” in India showed a higher score of depression among people with disability (18.5) than that of the general population (7.2) [4].

The relationship between depression and disability is bidirectional. Depression has shown to increase risk of activity limitation significantly. Also, disability and activity limitation is shown to have significant effect on depression and it increase with time [13,14]. The community-based study on depression among people with different forms of disabled is limited, especially in the context of Nepal. Given the influence of disability on mental health, this study helps to find the status of depression among people with disabilities and associated factors in the selected Municipality of Nepal. This study will provide a basis for designing various mental health intervention programs for people with disabilities and will assist policymakers and program planners to address mental health issues of people with disabilities.

## Methods

### Study population

A community-based cross-sectional study was conducted among 164 people with disabilities in Ilam Municipality of Province 1, Nepal from October to November 2019. The main objective of the study was to assess the prevalence of depression and associated factors among people with disabilities. Quantitative research method was used in the study. Study unit was individual.

The sample size was determined using the formula for finite population developed by Cochran in 1963 which is

$$n = \frac{Z^2 pq}{d^2 + \frac{Z^2 pq}{N}}$$

Where,

n = desired sample size

Z = standard normal deviate, usually set at 1.96 which correspond to 95% Confidence level

p = proportion of target population estimated to have a particular characteristic. Since, the prevalence of anxiety and depression among people with disabilities in context of Nepal and similar characteristic region was not available. Here, p = 0.5 or 50%.

$$q = 1-p$$

N = 243 (People with physical disabilities, hard of hearing and vision related disabilities obtained from Ilam municipality)

d = degree of accuracy required, usually set at 0.05 or 5%

Therefore,

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2 + \frac{(1.96)^2 \times 0.5 \times 0.5}{243}}$$

$$n = 149$$

Considering 10% non- response rate, the final sample size was

$$149 + 10\% \text{ of } 149$$

$$= 164$$

Simple random sampling, lottery method was used as sampling technique. A sampling frame of 243 people at the municipality level was obtained from the health section of the Ilam Municipality office. Using the Cochran formula for sample size calculation, the required sample size (n) was 164.

### Inclusion and exclusion criteria

People of the age group 18-65 were included in the study while those who were unable to complete the survey because of communication difficulties were excluded from the study. Inclusion criteria were confirmed through the municipality record. All 164 estimated samples were able to complete the study.

A pre-tested structured questionnaire was used to assess the socio-demographic characteristics and depression was measured by using a validated Nepali version of the Hospital Anxiety and Depression Scale (HADS) [15]. The validated scale has satisfactory construct validity and Cronbach's alpha of 0.68 [15]. Face-to-face interview was conducted using the questionnaire.

### Operational definition

#### Outcome variables

Depression: Validated Nepali version of standard Hospital Anxiety and Depression Scale (HADS-D) was used for assessing Depression. A cut-off value of HADS-D score 11 was used for assessing depression. A score of 11 or more was identified as Depression; 7-10 was identified as borderline depression and less than 7 was identified as Normal [15].

#### Independent variables

Disability: In this study, people with disabilities are defined as people with physical disabilities, hard of hearing and vision-related disabilities. Disability was classified as Very Severe (Profound),

Severe, Moderate, and Mild, as per the Nepal Law Commission. The classification states Profound disability is a condition where a person has difficulty performing their day-to-day activities even with continuous support of others. Severe disability is defined as a condition where people need continuous support from others to perform personal activities and to participate in social activities. Moderate disability is defined as a condition where a person can regularly participate in their daily activities and in social activities if physical facility is available, environmental barrier is ended or education or training is provided. Mild disability is defined as a condition where a person can regularly participate in their daily activities and social activities if there exists no physical and environmental barrier.

Economic Status: It is defined as per World Bank category of socio-economic status as extreme poverty or below poverty line for people living on less than 1.90 \$ per day. All sources of income for the household were identified and divided by the number of family members.

Reported co-morbidity: It is defined as having diagnosed with any health condition other than disability and depression.

Family type: Nuclear family is defined as those families with parents and children living together. Joint/extended family type is defined as those families with grandparents, parents and their children living together.

## Pre-testing



Pre-testing was done in Mahalaxmi municipality among 20 people with disabilities. Content and face validity was maintained through extensive literature review and consultation with experts.

### Data analysis

We entered and analyzed the data in Statistical Package for Social Science (SPSS IBM v. 22). Descriptive analysis for all variables was presented in the form of frequency and percentage. Chi-square test (at 5% level of significance and 95% CI) was used to assess the association between dependent and independent variables. The association of different independent variable with dependent variable was determined by binary logistic regression.

### Patient and public involvement

Patient and public were involved the design of study tools. During the initial phase of the study representative people with disabilities from National Federation of the Disabled Nepal were consulted and their suggestions were incorporated in the study. After publication, the findings from the study will be disseminated with people with disabilities and organizations working for assisting them.

### Results

Supplementary material 1 shows the distribution of the participant's characteristics. The mean age of the participants was  $38.37 \pm 15.75$  years with majority of them (57.9%) male. Majority (55.5%)

were unmarried, 48.5% of the respondents were living in joint family. 31.7% of the respondents were illiterate, 22.6% of the respondents were able to read and write without formal education, and nearly half (45.7%) had formal education. 38.4% of the respondents were unemployed, and 11.6% were student. A little bit more than half of the respondents (51.2%) were living below poverty. Majority (66.5%) of the respondents experienced violence. Emotional (98.9%) and mental violence (93.7%) was mostly reported type of violence. 40.2% of respondents reported never attending any social functions. Majority (62.2%)are not using any assistive device . Most (38.4%) of the respondents never do any sorts of physical activity. 97.9% of the respondents were smokers. (See supplementary material 1 for the table)

Table 1 shows the disability status of the respondents. Most (68.9%) of the respondents were with physical disabilities, 16.5% had vision related disabilities and 14.6% had hard of hearing. Severe and moderate disabilities were the most common (35.5%) among the respondents and 18% had mild disability. While, 11% of the respondents had severe disability. Half of the respondents had disability by birth and half acquired disability after birth

Table 1: Disability status of the respondents (n= 164)

Variables	Frequency	Percentage
Type of disability		

Physical	113	68.9
Vision	27	16.5
Hard of hearing	24	14.6
<b>Level of disability</b>		
Very severe	18	11
Severe	55	35.5
Moderate	61	35.5
Mild	30	18.3
<b>Duration of disability</b>		
After birth	82	50
By Birth	82	50

Table 2 shows the disease status of the respondents. Majority (76.2%) of the respondents had some form of co-morbidity. Among those with reported comorbidity, 53.8% reported hypertension. However, more than half (58.5%) reported having no treatment for the reported conditions. Majority (80%) of the respondents reported having no stressful life events in the past. Majority (69.5%) of the respondents were not satisfied with their life. Almost half (49.4%) of the respondents had suicidal ideation and 8.5% had attempted suicide in the past.

Table 2: Disease status of the respondent (n= 164)

Variables	Frequency	Percentage
<b>Reported co-morbidity</b>		
Yes	39	23.8
No	125	76.2
<b>Disease (n=39) *</b>		
Hypertension	21	53.8
Diabetes	9	17.6
Cancer	3	5.9
Others	18	35.3
<b>Treatment received for co-morbidity</b>		
Yes	68	41.5
No	96	58.5
<b>Stressful life events</b>		
Yes	32	19.5
No	132	80.5
<b>Satisfaction with life</b>		

14

Yes	50	30.5
No	114	69.5
<b>Suicidal ideation</b>		
Yes	81	49.4
No	83	50.6
<b>Suicidal attempts</b>		
Yes	14	8.5
No	150	91.5

Table 3 shows depression among the respondents. About 39% of the respondents had depression and 29.9% were in borderline depression. While, only 31.1% of the respondents were normal.

Table 3 : Depression among the respondents (n=164)

Variables	Frequency	Percentage
<b>Prevalence of depression</b>		
Depression	64	39
No Depression	100	61
<b>Level of depression</b>		

Depression	64	39
Borderline	49	29.9
Normal	51	31.1

Association between participant’s characteristics and depression are shown in supplementary material 2. Age (p=0.001), sex (p = 0.009), education status (p<0.001), employment (p<0.001), economic status (p<0.001) are found to be associated with depression. Experience of violence (p=0.001), Involvement in societal function (p<0.001), physical activity (p=0.001) are found to be significantly associated with depression. Depression was observed higher in older age groups (55 years and over).

(See supplementary material 2 for the table)

Association of disability status with depression is shown in table 4. Level of disability was found to be significantly associated with depression (p<0.001). Depression was observed higher among those with very severe level of disability.

Table 4: Association of disability status with depression (n= 164)

Variables	Depression (%)	No Depression (%)	P-value
Type of disability			

Physical	50 (44.2%)	63 (55.8%)	0.121
Vision	7 (25.9%)	20 (74.1%)	
Hard of hearing	7 (29.2%)	17 (74.1%)	
<b>Level of disability</b>			
Very severe	14 (77.8%)	4 (22.2%)	< 0.001
Severe	18 (32.7%)	37 (67.3%)	
Moderate	27 (44.3%)	34 (55.7%)	
Mild	5 (16.7%)	25 (83.3%)	
<b>Duration of disability</b>			
After birth	38 (46.3%)	44 (53.7%)	0.055
By Birth	26 (31.7%)	56 (68.3%)	

Table 5 shows the association of disease status of respondents with depression. Reported co-morbidity ( $p=0.030$ ), treatment received for co-morbidity conditions ( $p=0.010$ ), satisfaction with life ( $p<0.001$ ) and suicidal ideation ( $p<0.001$ ) are found to be significantly associated with depression.

Table 5 : Association of disease status with depression (n=164)

Variables	Depression (%)	No Depression (%)	P-value
<b>Reported co-morbidity</b>			
Yes	21(53.8%)	18 (46.2%)	0.030
No	43 (34.4%)	82 (65.6%)	
<b>Treatment received for co-morbidity</b>			
Yes	19 (27.5%)	50 (72.5%)	0.010
No	45 (47.4%)	50 (52.6%)	
<b>Stressful life events</b>			
Yes	14 (43.8%)	18 (56.3%)	0.541
No	50 (37.9%)	82 (62.1%)	
<b>Satisfaction with life</b>			
Yes	7 (14%)	43 (86%)	<0.001
No	57 (50%)	57 (50%)	
<b>Suicidal ideation</b>			
Yes	48 (59.3%)	33 (40.7%)	<0.001
No	16 (19.3%)	67 (80.7%)	



Suicidal attempts			
Yes	8 (57.1%)	6 (42.9%)	0.146
No	56 (37.3%)	94 (62.7%)	

### Logistic regression analysis

Table 6 shows the logistic regression analysis of covariates and depression. The model was significant with  $R^2=56.1\%$  and Hosmer Lemeshow significance= 0.939. Respondents of age group 55 and over had higher odds of having depression than younger ones (OR = 4.8,  $p = 0.013$ ). Likewise, Health service access by the respondents was also significantly associated with depression ( $p=0.047$ ). Respondents who receive some sort of treatment had lower odds of depression than who didn't received any (OR= 0.347). The odds of depression among respondents who had suicidal ideation was about 3 times the odds among those who never had suicidal ideation (OR= 2.7,  $p = 0.34$ ). Sex of the respondents was also significantly associated with depression. Female had higher odds of depression than male (OR= 2.9,  $p = 0.025$ ). Social activity was significantly associated with depression ( $p=0.058$ ). Those who participate in social functions were less likely to have depression in comparison to those who never (OR = 0.404). Economic status of the respondent was also significantly negatively associated with depression ( $p=0.005$ ). Those

who are above poverty line had lower odds of depression in comparison to those under poverty line (OR = 0.227)

Physical activity, education level, satisfaction with life, and employment was seen negatively associated with depression. However, the associations were not significant at 10% level of significance. On the other hand, experience of violence, time of onset of disability, having co-morbidity, and level of disability were seen positively associated with depression. The association was not significant at 10% level of significance.

Table 6 : Logistic regression analysis (n = 164)

Variables	B	Standard Error	p-value	Odds Ratio	95% CI for Odds Ratio	
					Lower	Upper
Physical activity	-.144	.555	.795	.866	.348	2.157
Education	-.469	.485	.334	.626	.282	1.389
Age	1.571	.629	.013	4.811	1.709	13.545
Violence	.088	.580	.880	1.092	.420	2.837
Time of disability onset	.088	.491	.857	1.093	.487	2.451
Treatment received	-1.059	.534	.047	.347	.144	.834

<b>Suicidal ideation</b>	1.018	.479	.034	2.767	1.259	6.083
<b>Satisfaction with life</b>	-.728	.660	.270	.483	.163	1.431
<b>Sex</b>	1.076	.479	.025	2.934	1.335	6.446
<b>Involvement in social functions</b>	-.905	.478	.058	.404	.184	.888
<b>Economic status</b>	-1.484	.527	.005	.227	.095	.540
<b>Reported comorbidity</b>	.896	.633	.157	2.449	.865	6.934
<b>Level of disability</b>	.598	.825	.469	1.819	.468	7.069
<b>Employment</b>	-.323	.542	.551	.724	.297	1.764
<b>Constant</b>	-.517	1.210	.669	.597		

## Discussion

This study showed 39% prevalence of depression among people with disability and 29.9% were found to be in borderline depression, higher than the national average (10%) among general population [16]. In contrast to this, a hospital-based study conducted on 'Level of Depression in 'Physically Disabled' in Pakistan among 35 permanently disabled patients showed 97% prevalence of depression [17]. One study conducted in Nepal among people with physical disabilities in a

selected disability care home of Nepal reported a very high, 77% prevalence of depression among people with physical disabilities [18]. This is higher than the study findings. While this study is conducted in community setting. The difference might be because of difference in the setting of the study.

This study also showed a significant association of age of the respondent with depression (OR = 4.8, CI: 1.7 – 13.5). Respondents who are 55 years and older had 5 times higher odds of depression than among younger than 55 years of age. Similarly study in Iraq also showed a significant association of age and depression (P=0.001) [15] and other few studies by Zaidi, Al-Abbudi and Shen et al. also found age as a strong predictor of depression [19–21].

This study showed significant association between sex and depression with higher prevalence in female than male (OR= 2.9, CI: 1.33 – 6.4). In line with the findings from many other studies that showed higher depression scores among females [19–21]. Contradicting the findings, another study on ‘Factors associated with anxiety and depression’ showed no difference between sexes in the prevalence of depression [22]. The difference in prevalence might be due to patriarchal society in the study area of this study. While, no statistically significant association of ethnicity, marital status, family type with depression was established in this study.

In the study we observed a negative association of physical activity, education level, satisfaction with life, and employment, and positive association between depression and experience of

1  
2  
3 violence, time of onset of disability, having co-morbidity, and level of disability. However, the  
4  
5 association was not significant ( $p > 0.1$ ). While, several studies have reported education level,  
6  
7 occupation, economic status, physical activity, and severity of disability as strong predictors of  
8  
9 depression [12,21,22]. In line with the findings from these studies, economic status of the  
10  
11 respondents were found to be significantly associated with depression. Respondents with  
12  
13 economic status were found to have lower odds of depression than those with poor economic status  
14  
15 (OR= 0.227, CI: 0.09 – 0.54). Similarly, studies by Okoro et.al. and another population-based  
16  
17 study on mobility limitation also showed significant association of physical inactivity with  
18  
19 depression among the respondents with disabilities [23,24]. In this study, although the association  
20  
21 was not statistically significant in adjusted analysis, higher odds of depression was observed  
22  
23 among those who never do physical exercise. Similar findings from a study by De Mello et al. was  
24  
25 observed. People who do not practice regular physical exercise are 2 times more likely to get  
26  
27 depression [25].  
28  
29  
30  
31  
32  
33

34 Treatment accessibility was found to be significantly associated with depression, similar to another  
35  
36 study by Shen et.al 2017 [21]. Those respondents who receive treatment for the conditions they  
37  
38 have were less likely to be depressed than those who never received any treatment (OR = 0.347,  
39  
40 CI: 0.14-0.83). Treatment accessibility also explains the economic as well social condition of the  
41  
42 respondent. This shows that poor mental health among those who are deprived of health services.  
43  
44 The Lancet in 2012, concluded that violence is a major problem in adults with disabilities. High  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

prevalence of violence, 66.5% among people with disability was observed in this study. Likewise, a few other studies by Olofsson et al. 2014, Monteso. 2017 and Hughes et al. also found higher prevalence of violence among people with disability [26–28]. However, no significant association between experience of violence and depression was observed in this study. In the study, respondents with better involvement in social function showed less depression (OR = 0.404, CI : 0.18– 0.88). This is in line with the findings from another study which showed better social participation has lesser odds of depression [21].

Several studies have established depression as a major risk factor for suicide [29]. In this study, we observed 49.4% of the respondent have a thought of suicide and 8.5% had attempted. This is significantly higher than reported in a study by Nosek et. al, which showed 20% prevalence of suicidal ideation [30]. The difference may be attributed by the factor that the study was conducted only among female in a different socio-cultural setting. In this study, suicidal ideation was found to be significantly associated after adjustment ( $p = 0.034$ ). Odds of depression was 2.7 times higher among the respondents who had suicidal ideation in comparison to those respondents who never had (OR = 2.767, CI : 1.26 – 6.08).

This study explored the least explored and stigmatized matter of depression among people with disabilities. To the best of our knowledge, such type of community-based studies focusing mental health of people with different types of disabilities are limited in the context of Nepal. Most of the

studies are done in institutional settings and focus on a single type of disability. This study is a community-based study including people with hard of hearing, vision-related, and physical disabilities. The study is limited to one rural municipality of Nepal and only includes the people with disabilities who were listed on the municipality disability list. The study does not include those people who were not listed. Another major limitation of the study is that the study has no comparison group as the study was focused more on assessing the magnitude of the problem among people with disabilities. A large-scale study on mental health of people with disabilities is recommended to grab a globally representative scenario.

## Conclusion

The study showed, out of 164 people with disabilities of Ilam municipality, 39% of the respondents had depression and about one third participants were in borderline depression. The study identified Age, sex, economic status, involvement in social activities, satisfaction with life, suicidal ideation, treatment as factors contributing to depression. Therefore, these factors need to be considered for better health and well-being and for preventing depression among people with disabilities.

## Ethical approval

Ethical approval was obtained from the institutional review committee of Manmohan Memorial Institute of Health Sciences, Kathmandu Nepal; MMIHS IRC 320. Informed written consent was taken from each participant after explaining the objective of the study.

## Data Availability

Additional data can be provided upon request to the corresponding author.

## Funding

This study has not been financially supported by any organization.

## Conflict of Interest

The authors declare that there is no conflict of interest regarding the publication of this paper.

## Contributors:

Both the authors contributed to each step in the study; design, analysis and writing. Durga Khadka Mishra was involved in all stages of the study from the beginning and supervised throughout the study, involved in writing and provided critical intellectual review and edits to the writing. Apekshya Ghimire was thoroughly involved from the very initial stage of the study, conceptualizing, literature review, proposal and tool development, data collection, management and analysis, and manuscript writing. AG and DKM are the guarantor for the study. Corresponding author (AG) ensures that all authors meet the authorship criteria.

## Acknowledgments



We would like to acknowledge all the participants of this study and Ilam municipality and Karuna Foundation Nepal for their support. We would like to heartily thank all the faculty members of the Department of Public Health, Manmohan Memorial Institute of Health Sciences

References

1. World Health Organization. International classification of impairments, disabilities, and handicaps : a manual of classification relating to the consequences of disease, published in accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, May 1976 [Internet]. World Health Organization; 1980 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/41003>
2. World Health Organization. WHO fact sheet on disability and health. 2023 [cited 2024 Oct 10]. Disability. Available from: <https://www.who.int/news-room/fact-sheets/detail/disability-and-health>
3. World Health Organization. WHO global disability action plan 2014-2021: better health for all people with disability [Internet]. World Health Organization; 2015 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/199544>
4. Mushtaq S, Akhouri D. Self esteem, anxiety, depression and stress among physically disabled people. International Journal of Indian Psychology. 2016;3(4):64.
5. WHO EMRO | Depression: Let’s talk | World Health Day 2017 | World Health Days [Internet]. [cited 2021 Jun 14]. Available from: <http://www.emro.who.int/world-health-days/world-health-day-2017/depression-lets-talk.html>

6. Organization WH. Depression and other common mental disorders: global health estimates. 2017 [cited 2021 Jun 14]; Available from: <https://apps.who.int/iris/handle/10665/254610>
7. Noh JW, Kwon YD, Park J, Oh IH, Kim J. Relationship between Physical Disability and Depression by Gender: A Panel Regression Model. PLOS ONE. 2016 Nov 30;11(11):e0166238.
8. Hollon SD, Cohen ZD, Singla DR, Andrews PW. Recent Developments in the Treatment of Depression. Behav Ther. 2019 Mar;50(2):257–69.
9. Bradley SM, Rumsfeld JS. Depression and cardiovascular disease. Trends Cardiovasc Med. 2015 Oct;25(7):614–22.
10. Yokoya S, Maeno T, Sakamoto N, Goto R, Maeno T. A Brief Survey of Public Knowledge and Stigma Towards Depression. J Clin Med Res. 2018 Mar;10(3):202–9.
11. Aneshensel CS, Frerichs RR, Huba GJ. Depression and Physical Illness: A Multiwave, Nonrecursive Causal Model. Journal of Health and Social Behavior. 1984;25(4):350–71.
12. Jones KH, Jones PA, Middleton RM, Ford DV, Tuite-Dalton K, Lockhart-Jones H, et al. Physical Disability, Anxiety and Depression in People with MS: An Internet-Based Survey via the UK MS Register. PLoS One. 2014 Aug 25;9(8):e104604.

13. Zhou L, Wang W, Ma X. The bidirectional association between the disability in activities of daily living and depression: a longitudinal study in Chinese middle-aged and older adults. BMC Public Health. 2024 Jul 15;24(1):1884.

14. Jiang C hong, Zhu F, Qin T ting. Relationships between Chronic Diseases and Depression among Middle-aged and Elderly People in China: A Prospective Study from CHARLS. CURR MED SCI. 2020 Oct 1;40(5):858–70.

15. Risal A, Manandhar K, Linde M, Koju R, Steiner TJ, Holen A. Reliability and Validity of a Nepali-language Version of the Hospital Anxiety and Depression Scale (HADS). Kathmandu Univ Med J (KUMJ). 2015 Jun;13(50):115–24.

16. Jha DAK, Ojha DSP. National Mental Health Survey Team. Nepal Health Research Council [Internet]. 2020; Available from: <https://nhrc.gov.np/wp-content/uploads/2022/10/National-Mental-Health-Survey-Report2020.pdf>

17. Hussain N, Sikander M, Maqsd M. Level of Depression in Physically Disabled. 2014;5.

18. Karki P, Shahi PV, Sapkota KP, Bhandari R, Adhikari N, Shrestha B. Depressive symptoms and associated factors among persons with physical disabilities in disability care homes of Kathmandu district, Nepal: A mixed method study. PLOS Global Public Health. 2023 Jan 12;3(1):e0001461.

19. Al-Abbudi S, Ezzat K, Zebala A, Hamdy D, Beedany M, Farhan M. Prevalence and Determinants of Depression Among Traumatic Spinal Cord Injured Patients Attending Ibn-Al-Quff Hospital, Baghdad, Iraq. *Journal of Psychiatry*. 2017 Jan 1;20.
20. Zaidi SM. COMORBIDITY OF PHYSICAL DISABILITY WITH DEPRESSION AND ANXIETY. *International Journal of Environment, Ecology, Family and Urban Studies (IJEEFUS)*. 2013 Mar 30;3:79–86.
21. Shen SC, Huang KH, Kung PT, Chiu LT, Tsai WC. Incidence, risk, and associated factors of depression in adults with physical and sensory disabilities: A nationwide population-based study. *PLoS One*. 2017 Mar 31;12(3):e0175141.
22. Gale CR, Sayer AA, Cooper C, Dennison EM, Starr JM, Whalley LJ, et al. Factors associated with symptoms of anxiety and depression in five cohorts of community-based older people: the HALCYon (Healthy Ageing across the Life Course) Programme. *Psychol Med*. 2011 Oct;41(10):2057–73.
23. Okoro CA, Strine TW, Balluz LS, Crews JE, Mokdad AH. Prevalence and correlates of depressive symptoms among United States adults with disabilities using assistive technology. *Prev Med*. 2010 Apr;50(4):204–9.

24. Rask S, Castaneda AE, Koponen P, Sainio P, Stenholm S, Suvisaari J, et al. The association between mental health symptoms and mobility limitation among Russian, Somali and Kurdish migrants: a population based study. BMC Public Health. 2015 Mar 20;15:275.

25. De Mello MT, Lemos V de A, Antunes HKM, Bittencourt L, Santos-Silva R, Tufik S. Relationship between physical activity and depression and anxiety symptoms: a population study. J Affect Disord. 2013 Jul;149(1–3):241–6.

26. Montesó-Curto P, Aguilar C, Lejeune M, Casadó-Marin L, Casanova Garrigós G, Ferré-Grau C. Violence and depression in a community sample. J Clin Nurs. 2017 Aug;26(15–16):2392–8.

27. Olofsson N, Lindqvist K, Danielsson I. Higher risk of violence exposure in men and women with physical or sensory disabilities: results from a public health survey. J Interpers Violence. 2015 Jun;30(10):1671–86.

28. Hughes K, Bellis MA, Jones L, Wood S, Bates G, Eckley L, et al. Prevalence and risk of violence against adults with disabilities: a systematic review and meta-analysis of observational studies. Lancet. 2012 Apr 28;379(9826):1621–9.

- 1  
2  
3 29. Choi SB, Lee W, Yoon JH, Won JU, Kim DW. Risk factors of suicide attempt among people  
4 with suicidal ideation in South Korea: a cross-sectional study. BMC Public Health. 2017  
5  
6 Dec;17(1):579.  
7  
8  
9  
10  
11 30. Nosek MA, Hughes RB, Robinson-Whelen S. The complex array of antecedents of depression  
12 in women with physical disabilities: implications for clinicians. Disabil Rehabil.  
13  
14 2008;30(3):174–83.  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

Table: Distribution of participant’s characteristics (n=164)

Variables	Frequency	Percentage
<b>Age</b>		
Mean ± SD	38.37 ± 15.75	
Range	18-65	
15-35	82	50
35-55	50	30.5
55 and above	32	19.5
<b>Sex</b>		
Male	95	57.9
Female	69	42.1
<b>Marital status</b>		
Unmarried	91	55.5
Married	73	44.5
<b>Family type</b>		
Nuclear	68	41.5
Joint	96	58.5
<b>Education status</b>		
Illiterate	52	31.7
Literate	37	22.6
Formal education	75	45.7
<b>Employment</b>		
Unemployed	63	38.4



Employed	29	17.7
Housemakers	26	15.8
Students	19	11.6
Agriculture	27	16.5
<b>Economic status</b>		
Below poverty	84	51.2
Above poverty	80	48.7
<b>Experience of violence</b>		
Yes	109	66.5
No	55	33.5
<b>Types of violence (109)*</b>		
Physical	20	21.1
Sexual	6	6.3
Mental	89	93.7
Emotional	94	98.9
Deprivation	54	20.5
<b>Involvement in social function</b>		
Almost every function	26	15.9
Sometimes	72	43.9
Never	66	40.2
<b>Assistive device</b>		
Yes	62	37.8

No	102	62.2
Physical activity		
Never	63	38.4
Sometimes	47	28.7
Regular	54	32.9
Substance abuse		
Yes	47	28.7
No	117	71.3
Types of substance abuse*		
(n=47)		
Alcohol	19	40.4
Smoking	46	97.9
Other	2	4.2

\*=multiple responses recorded where participants provided more than one categories of response

Table: Association of participant's characteristics with depression (n=164)

Variables	Depression (%)	No Depression (%)	P-value
Age			
16-35	23 (28%)	59 (72%)	0.001
36-55	19 (38.8%)	30 (61.2%)	
55 and above	22 (66.7%)	11 (33.3%)	
Sex			
Male	29 (30.5%)	66 (69.5%)	0.009
Female	35 (50.7%)	34 (49.3%)	
Marital status			
Married	35 (47.9%)	38 (52.1%)	0.36
Unmarried	29 (31.9%)	62 (68.1%)	
Family type			
Nuclear	27 (39.7%)	41 (60.3%)	0.88
Joint	37 (38.5%)	59 (61.5%)	
Education status			
Illiterate	33 (63.5%)	19 (36.5%)	<0.001
Literate	17 (45.9%)	20 (54.1%)	
Formal education	14 (18.7%)	61 (81.3%)	
Employment			
Unemployed	32 (50.8%)	31 (49.2%)	< 0.001
Employed	7 (24.1%)	22 (75.9%)	
Housemakers	17 (65.4%)	9 (34.6%)	

Students	2 (10.5%)	17 (89.5%)	
Agriculture	6 (22.2%)	21 (77.8%)	
<b>Economic status</b>			
Below poverty	50 (59.5%)	34 (40.5%)	< 0.001
Above poverty	14 (17.5%)	66 (82.5%)	
<b>Experience of violence</b>			
Yes	52 (47.7%)	57 (52.3%)	0.001
No	12 (21.8%)	43 (78.2%)	
<b>Involvement in social function</b>			
Almost every function	3 (11.5%)	23 (88.5%)	<0.001
Sometimes	22 (30.6%)	50 (69.4%)	
Never	39 (59.1%)	27 (40.9%)	
<b>Assistive device</b>			
Yes	24 (38.7%)	38 (61.3%)	0.949
No	40 (39.2%)	62 (60.8%)	
<b>Physical activity</b>			
Never	35 (55.6%)	28 (44.4%)	0.001
Sometimes	17 (36.2%)	30 (63.8%)	
Regular	12 (22.2%)	42 (77.8%)	
<b>Substance abuse</b>			
Yes	23 (48.9%)	24 (51.1%)	0.099
No	41 (35%)	76 (65%)	

For peer review only

# BMJ Open

## Depression among individuals with disabilities: A community-based cross-sectional study in Nepal

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2023-082955.R2
Article Type:	Original research
Date Submitted by the Author:	21-Jan-2025
Complete List of Authors:	Ghimire, Apekshya; Manmohan Memorial Institute of Health Sciences, Department of Public Health Mishra, Durga Kumari Khadka; Manmohan Memorial Institute of Health Sciences, Department of Public Health
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Public health, Mental health
Keywords:	PUBLIC HEALTH, MENTAL HEALTH, Depression & mood disorders < PSYCHIATRY

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies. Enseignement Supérieur (ABES).

# Depression among individuals with disabilities: A community-based cross-sectional study in Nepal

Apekshya Ghimire<sup>1</sup>, Durga Khadka Mishra<sup>1</sup>

<sup>1</sup>Department of Public Health, Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal

Corresponding to: Apekshya Ghimire

apekshyaghimire9@gmail.com

For peer review only



1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

# ABSTRACT

## Objective

To assess the prevalence of depression among people with disabilities and its associated factors.

## Design

A cross-sectional study was done using the quantitative research method.

## Setting

The community-based study was conducted in Ilam Municipality, Nepal, from October to November 2019.

## Participants

The study was conducted among 164 people with physical, hearing, and vision-related disabilities in Ilam municipality, Nepal. Participants were drawn using a simple random sampling method using the sampling frame obtained from Ilam municipality.

## Main outcome measure

Depression and its associated factors among people with disabilities by using a validated Nepali version of the Hospital Anxiety and Depression Scale (HADS-D) and a pre-tested structured questionnaire.

## Results

The prevalence of depression was 39% among people with disabilities, and 29.9 % of the respondents were in borderline depression. In an unadjusted analysis, depression was significantly

associated with comorbidities, absence of medical intervention, severe disabilities, and disabilities acquired at birth, with a p-value < 0.05. After adjusting for individual-level factors (age, sex, education, employment, and physical activities), the level of disability and treatment accessibility were significantly associated with depression. After adjusting for family and community-level factors (economic status, experience of violence, and social participation), depression remained significantly associated with having comorbidities, absence of medical intervention, and presence of very severe disabilities (p-value < 0.05). When adjusted for both individual and community-level factors, the level of disability continued to show a significant association with depression with odds ratio (OR) = 6.36 (moderate vs. mild), 2.11 (severe vs. mild), and 13.3 (very severe vs. mild), and overall p-value of 0.045. Across all three adjusted models, the level of disability was significantly associated with depression (p-value < 0.05).

## Conclusion

Depression is one of the major global public health concerns, with people with disabilities being particularly vulnerable. Ensuring the health and well-being of people with disabilities requires focused attention and strategic planning, emphasizing disease prevention, health promotion, and improved access to care.

## Keywords

People with disabilities, physical disabilities, hard of hearing, vision-related disabilities, Depression

## Strengths and Limitations of the Study

- It is a community-based study that includes people with different types of disabilities.

- This study has no comparison group.
- The study was conducted among individuals with disabilities listed in the Ilam municipality's records; it does not include individuals with disabilities who are not listed.

## Introduction

Disability refers to a lack of ability or restriction in performing activities due to impairment. These activities may include interpersonal relations, work, physical, mental, and intellectual functions [1]. Disability is a growing public health challenge, affecting an increasing number of people annually. In 2023, approximately 1.3 billion people (16% of the global population) were estimated to have severe disabilities [2]. This rising burden is largely attributed to the growing prevalence of non-communicable diseases, genetic factors, complications during childbirth, and delays in the diagnosis and treatment of underlying conditions leading to disability. In this study, "disability" is used as an umbrella term encompassing impairments, activity limitations, and participation restrictions among individuals with physical, visual, and hearing impairments.

Everyone is likely to experience some form of disability at some point in their life, especially as they age [3]. Despite the widespread prevalence of disability, individuals with disabilities often face stigmatization, discrimination, inequalities, and restrictions on participation. Their rights and dignity are frequently violated through acts of violence, abuse, and disrespect—barriers that are entirely preventable [3]. These challenges, coupled with emotional distress, further predispose the development of mental disorders among individuals with disabilities [3,4].

Depression is a common mental disorder characterized by persistent sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, tiredness, and poor concentration [5,6]. People with disabilities are three times more likely to experience depression compared to the general population [7]. Globally, an estimated 322 million people are living with depression, which is one of the leading causes of disability worldwide and directly impacts an individual's quality of life [5,8–10]. Both depression and disability are highly stigmatized in our

society [7,11]. A 2014 study conducted in Pakistan among permanently disabled individuals found that 42.86% had moderate depression, 37.14% had severe depression, and 14.29% had extreme depression [12]. Likewise, multiple studies on depression and physical illness have shown a positive correlation between depression and physical disability [13,14]. A recent study in India reported a higher score of depression among individuals with disabilities (18.5) compared to the general population (7.2) [4].

The relationship between depression and disability is bidirectional: depression significantly increases the risk of activity limitations, while disability and activity limitations also have a substantial, time-dependent impact on depression [15,16]. Community-based studies on depression among people with different disabilities are limited, especially in Nepal. This study aims to assess the prevalence of depression and related factors among people with disabilities in a selected Nepalese municipality. The findings will support the development of mental health intervention and aid policymakers in addressing mental health needs within this population.

## Methods

### Study population

A community-based cross-sectional study was conducted among 164 people with disabilities in Ilam Municipality of Province 1, Nepal, from October to November 2019. The study aimed to assess the prevalence of depression and its associated factors among individuals with disabilities. A quantitative research method was used, with the individual as the study unit. Since the study was carried out among people with disabilities not every participant could complete the survey questionnaire by themselves. Therefore, a face-to-face interview technique was used to collect data

about depression status, disease status, disability, and other covariates by asking the participants the structured survey questions and recording their responses.

The sample size was determined using the formula for finite population developed by Cochran in 1963:

$$n = \frac{Z^2 pq}{d^2 + \frac{Z^2 pq}{N}}$$

Where,

n = desired sample size

Z = standard normal deviation, set at 1.96, corresponding to 95% confidence level

p = proportion of target population estimated to have a particular characteristic. Since data on the prevalence of anxiety and depression among people with disabilities in Nepal or similar regions was unavailable, a prevalence rate of p = 50% was assumed.

q = 1-p

N = 243 (Number of individuals with physical disabilities, hearing impairments, and vision-related disabilities obtained from Ilam municipality records.)

d = degree of accuracy required, usually set at 5%

Therefore,

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2 + \frac{(1.96)^2 \times 0.5 \times 0.5}{243}}$$

n = 149

Considering non-response rate of 10%, the final sample size was calculated to be:

$$149 + 10\% \text{ of } 149 = 164$$

The sample size of n=164 was selected from a sampling frame of 243 people obtained from the health section of the Ilam Municipality office, using random sampling with a lottery method. The study achieved a 100% response rate, with all 164 selected individuals consenting to participate and successfully completing the survey.

### **Inclusion and exclusion criteria**

The study included individuals aged 18-65 years, while those unable to complete the survey due to communication difficulties were excluded. Inclusion criteria were verified using the municipality records.

### **Data Collection Tools and Techniques**

Face-to-face interviews were conducted using a pre-tested structured questionnaire to assess the socio-demographic characteristics of the study population. Depression was measured using a validated Nepali version of the Hospital Anxiety and Depression Scale (HADS-D), which has a satisfactory construct validity and Cronbach's alpha of 0.68 [17].

### **Study Variables**

Outcome variables

A validated Nepali version of the standard Hospital Anxiety and Depression Scale (HADS-D) was used to assess depression, the primary outcome variable. The HADS is a 14-item, 4-point scale that assesses how respondents have been feeling in the past 7 days. The depression subscale

(HADS-D) has seven items, each item's score ranging from 0-3, with 3 indicating higher severity of the particular depressive symptom, with the total summed score ranging from 0-21. A HADS-D score of 11 was used as the cutoff for assessing depression, with scores of 11 or higher classified as indicating depression, scores between 7 and 10 considered borderline depression, and scores below 7 classified as normal [17]. The primary outcome variable, depression, was classified as Yes (HADS-D score  $\geq 11$ ) or No (HADS-D score  $\leq 10$ ). Respondents also reported other depressive symptoms like suicidal ideation or attempts and recent stressful life events (also categorized as Yes or No).

#### Primary independent variables

Our primary independent variables were the disability and disease status of the participants. Disability was defined based on the classification criteria provided by the Central Bureau of Statistics (CBS), Nepal, categorized into physical disabilities, hard of hearing, and vision-related disabilities. Each category was further classified into four different severity levels – very severe (profound), severe, moderate, and mild – following Nepal Law Commission guidelines. Participants indicated their type of disabilities, severity level, and time of onset of disability (from birth or acquired later in life) in the completed questionnaire, based on the disability card from government of Nepal.

Profound disability is a condition where a person has difficulty performing their day-to-day activities even with the continuous support of others. Severe disability is defined as a condition where people need continuous support from others to perform personal activities and to participate in social activities. Moderate disability is defined as a condition where a person can regularly participate in their daily and social activities if a physical facility is available, environmental



barrier is ended, or education or training is provided. Mild disability is defined as a condition where a person can regularly participate in their daily and social activities if no physical or environmental barrier exists.

To assess disease status, respondents were asked if they had been diagnosed with any health condition (Yes or No). Respondents answering “Yes” were further asked to specify the diagnosed condition (Hypertension, Diabetes, Cancer, Others). Respondents also reported whether they have been receiving any medical care.

### Covariates

Sociodemographic variables were classified into individual-level and family/community-level variables. Individual-level variables included in the study are: *Age in completed years* (Categorized as 18-35, 36-55, and 56- 65), *Sex* (Categorized as Male or Female), *Education level* (Categorized as Illiterate, Literate, or Formal education), *Employment status* (Categorized as Employed, Housemakers, Agriculture, Student, or Unemployed), *Physical activity* (Categorized as Never, Sometimes, or Regular, based on WHO physical activity criterion), *Substance abuse status* (Yes (alcohol, smoking, or drugs) or No).

Likewise, the family/community-level variables considered in the study included *Experience of violence* (Yes or No), *Social participation level* (Categorized as Almost every function, Sometimes, or Never), *Economic status* (Categorized as Below or Above poverty level, based on the per-capita income in the family). The threshold poverty level was defined as less than 1.90 \$ per day based on the World Bank's socioeconomic status category. All household income sources were identified and divided by the number of family members to calculate the per-capita income.

Respondents also reported their *Family type* (Categorized as Nuclear or Joint/Extended). A nuclear family was defined as families consisting of parents and children living together. The joint/extended family type is where grandparents, parents, and children are living together.

### Pre-testing

Pre-testing was done in Mahalaxmi municipality among 20 people with disabilities. Content and face validity were maintained through extensive literature review and expert consultation.

### Data analysis

We entered and analyzed the data in Statistical Package for Social Science (SPSS IBM v. 22) and SAS v. 9.4. Descriptive analysis for all variables is presented as frequency and percentage. The Chi-square test (at a 5% significance level and 95% CI) assessed the unadjusted association between dependent and independent variables. The independent variables with significant association ( $p\text{-value} < 0.05$ ) in the unadjusted analysis were adjusted in the subsequent models, while those with high correlation (suicidal ideation and attempts) were excluded. The association of primary independent variables (disability and disease status) and outcome variable (depression) adjusted for the sociodemographic variables was calculated using three logistic regression models. Model 1 is the crude model with no adjustment; Model 2 adjusts for individual-level sociodemographic factors (age, education, employment, physical activity status); Model 3 adjusts for family/community-level sociodemographic factors (social participation, experience of violence, and economic status), and Model 4 adjusts for both the individual and family/community level socio-demographic variables. Model 2 was significant with  $\text{pseudo-R}^2 = 38.1\%$ , Hosmer and Lemeshow significance = 0.31; model 3 was significant with  $\text{pseudo-R}^2 = 33.68\%$ , Hosmer and

Lemeshow significance = 0.94; and model 4 was significant with pseudo-R<sup>2</sup> 43.43.% and Hosmer and Lemeshow significance = 0.654. Variance Inflation Factors (VIFs) calculated for each independent variable in the model using the R<sup>2</sup> value were less than 2 for all the variables in the model.

**Patient and public involvement**

Patients and the public were involved in the design of study tools. During the initial phase of the study, representative people with disabilities from the National Federation of the Disabled, Nepal, were consulted, and their suggestions were incorporated into the study. After publication, the findings from the study will be disseminated to people with disabilities and organizations working to assist them.

**Results**

**Sociodemographic characteristics**

Supplementary material Table S.1 shows the distribution of the participants' sociodemographic characteristics. The mean age of the participants was 38.37 ± 15.75 years, with a majority (57.9%) being male. The majority (55.5%) were unmarried, and 48.5% of the respondents lived in a joint family. Regarding education, 31.7% of the respondents were illiterate, 22.6% were literate without formal education, and (45.7%) had formal education. Unemployment was reported by 38.4% of the respondents, while 11.6% were students. More than half of the respondents (51.2%) lived below the poverty level. The majority (66.5%) of the respondents experienced violence. Among those who experienced violence, 98.9% reported experiencing emotional and 93.7% reported experiencing mental violence. Regarding social participation, 40.2% of respondents reported never

attending any social functions. The majority (62.2%) did not use any assistive devices. Most (38.4%) of the respondents never did any physical activity. Among the respondents (28.7%) who reported 'Yes' to substance abuse practice, 97.9% of the respondents were smokers. The detailed demographic data is reported in Supplementary Material Table S.1.

### Depressive symptoms

**Error! Reference source not found.** Table 1 shows the depressive symptoms of the respondents. Depression was identified in 39% of the respondents; 29.9% were in borderline depression, while only 31.1% of the respondents were normal. The majority (80%) of the respondents reported having no stressful life events in the past. Most (69.5%) of the respondents were not satisfied with their life. Almost half (49.5%) of the respondents had suicidal ideation, and 8.5% had attempted suicide in the past.

Table 1: Depressive symptoms of the respondent

Variables	Frequency	Percentage
<b>Prevalence of depression (n= 164)</b>		
Depression	64	39
No Depression	100	61
<b>Level of depression (n= 164)</b>		
Depression	64	39
Borderline	49	29.9
Normal	51	31.1
<b>Stressful life events (n= 164)</b>		
Yes	32	19.5
No	132	80.5
<b>Satisfaction with life (n= 164)</b>		

Yes	50	30.5
No	114	69.5
<b>Suicidal ideation (n= 164)</b>		
Yes	81	49.4
No	83	50.6
<b>Suicidal attempts (n= 164)</b>		
Yes	14	8.5
No	150	91.5

Disability and disease status

Table 2 shows the disability and disease status of the respondents. Most (68.9%) of the respondents had physical disabilities, 16.5% had vision-related disabilities, and 14.6% had hard of hearing. Severe and moderate disabilities were most common (33.5% and 37.2%, respectively) among the respondents, and 18% had mild disability, while 11% of the respondents had very severe disability. Half of the respondents had a disability at birth, and half acquired disabilities after birth. About 24% of the respondents had some form of co-morbidity. Among those a majority (53.8 %) reported having hypertension. Despite the prevalence of co-morbidities, more than half (58.5%) reported having no any treatment .

Table 2: Disability and disease status of the respondents

Variables	Frequency	Percentage
<b>Type of disability (n= 164)</b>		
Physical	113	68.9
Vision	27	16.5
Hard of hearing	24	14.6

<b>Level of disability (n= 164)</b>		
Very severe	18	11.0
Severe	55	33.5
Moderate	61	37.2
Mild	30	18.3
<b>Duration of disability (n= 164)</b>		
After birth	82	50.0
By Birth	82	50.0
<b>Co-morbidity(n= 164)</b>		
Yes	39	23.8
No	125	76.2
<b>Disease (n=39) *</b>		
Hypertension	21	53.8
Diabetes	9	17.6
Cancer	3	5.9
Others	18	35.3
<b>Treatment received (n= 164)</b>		
Yes	68	41.5
No	96	58.5

\* Multiple responses reported by some participants

### Association of respondents' characteristics and depression

The association between participants' sociodemographic characteristics and depression following a crude Chi-square analysis are shown in Supplementary Material table S.2. Age ( $p = 0.001$ ), sex ( $p = 0.009$ ), education status ( $p < 0.001$ ), employment ( $p < 0.001$ ), economic status ( $p < 0.001$ ) were found to be significantly associated with depression. Likewise, experience of violence ( $p = 0.001$ ), social participation ( $p < 0.001$ ), and physical activity ( $p = 0.001$ ) were found to be

significantly associated with depression. Depression was observed higher in older age groups (56-65 years) in comparison to younger age groups. (See Supplementary Material Table S.2)

Association of disability, disease status, and depression

The unadjusted association of disability, disease status, and depression is shown in Table 3. The level of disability was found to be significantly associated with depression ( $p < 0.001$ ). Depression was observed to be higher among those with very severe levels of disability. Reported co-morbidity ( $p = 0.030$ ), treatment received for existing conditions ( $p = 0.010$ ), satisfaction with life ( $p < 0.001$ ), and suicidal ideation ( $p < 0.001$ ) were found to be significantly associated with depression.

Table 3: Unadjusted association of disability, disease status, and depression

Variables	Depression (%)	No Depression (%)	P-value
<b>Type of disability (n= 164)</b>			
Physical	50 (44.2%)	63 (55.8%)	0.121
Vision	7 (25.9%)	20 (74.1%)	
Hard of hearing	7 (29.2%)	17 (74.1%)	
<b>Level of disability (n= 164)</b>			
Very severe	14 (77.8%)	4 (22.2%)	< 0.001
Severe	18 (32.7%)	37 (67.3%)	
Moderate	27 (44.3%)	34 (55.7%)	
Mild	5 (16.7%)	25 (83.3%)	
<b>Duration of disability (n= 164)</b>			
After birth	38 (46.3%)	44 (53.7%)	0.054
By Birth	26 (31.7%)	56 (68.3%)	
<b>Co-morbidity (n= 164)</b>			
Yes	21(53.8%)	18 (46.2%)	0.030

No	43 (34.4%)	82 (65.6%)	
Treatment received (n= 164)			
Yes	19 (27.5%)	50 (72.5%)	0.010
No	45 (47.4%)	50 (52.6%)	
Stressful life events (n= 164)			
Yes	14 (43.8%)	18 (56.3%)	0.541
No	50 (37.9%)	82 (62.1%)	
Satisfaction with life (n= 164)			
Yes	7 (14%)	43 (86%)	<0.001
No	57 (50%)	57 (50%)	
Suicidal ideation (n= 164)			
Yes	48 (59.3%)	33 (40.7%)	<0.001
No	16 (19.3%)	67 (80.7%)	
Suicidal attempts (n= 164)			
Yes	8 (57.1%)	6 (42.9%)	0.146
No	56 (37.3%)	94 (62.7%)	

Table 4 shows the four different regression models assessing the association of disability and disease status with depression among people with disabilities. In the crude model, which did not adjust for any factors, disease status (comorbidity), treatment status, level of disability, and time of onset of disability were significantly associated with depression (p-value <0.05). Respondents with comorbidities had higher odds of depression compared to those without comorbidities (OR= 2.23). Health service access was another significant factor associated with depression, with those who did not receive medical care having higher odds of depression compared to those who were receiving care (OR= 2.37). The severity of disability was also a significant factor, with respondents with very severe, severe, and moderate disabilities having higher odds of depression (OR= 17.5,



2.43, 3.97, respectively) compared to those with mild disabilities. Respondents who acquired disability later in life had 1.9 times higher odds of depression than those who had disabilities at birth. However, the association of type of disability and depression was not significant at 0.05 level of significance.

Model 2 assessed the association of disability, disease status, and depression, adjusting for individual-level factors (age, sex, education, employment status, and physical activity level of the respondents). Treatment received was significantly associated with depression, with individuals not receiving any care having 3.41 times the odds of depression compared to those under some form of treatment. A similar association was observed with the level of disability, with very severe, severe, and moderate disabilities having 26.8, 3.96, and 8.03 times higher odds of depression, respectively, than those with mild depression.

Model 3 examined the association between disability, disease status, and depression, adjusting for family/community-level factors (economic status, experience of violence, and social participation). The model demonstrated a significant association of depression with the presence of comorbidities, treatment received, and the level of disabilities. Individuals with co-morbidities had 4.63 times higher odds of depression than those without comorbidities (p-value = 0.009). Likewise, individuals receiving no treatment had 3.37 higher odds of depression compared to those under some form of treatment (p-value = 0.02). The association between the level of disability and depression was still significant in Model 3 consistent with Model 1 (crude model) and Model 2 (adjusted for individual-level factors). Individuals with very severe, severe, and moderate disabilities had 7.6, 1.7, and 4.59 times higher odds of depression, respectively, than those with mild levels of disability.

After adjusting for both individual-level and family/community-level factors in Model 4, only the level of disabilities was found to be significantly associated with depression, where those with very severe, severe, and moderate level disabilities had 13.3, 2.1, and 13.3 times the odds of depression among those with a mild level of disabilities.

Pseudo-  $R^2$  value of 36%, 33% and 43% were reported by Model 2, Model 3, and Model 4 respectively. This shows both the individual and family/community level factors together better predicts depression among individuals with disabilities.

Table 4: Association of disability, disease status, and depression (n=164)

Primary Independent Variables	Crude			Adjusted for individual-level socio-demographic factors			Adjusted for family/community-level socio-demographic factors			Adjusted for both socio-demographic factors		
	Odds Ratio	95% C.I. <sup>†</sup>	p-value <sup>‡</sup>	Odds Ratio	95% C.I. <sup>†</sup>	p-value <sup>‡</sup>	Odds Ratio	95% C.I. <sup>†</sup>	p-value <sup>‡</sup>	Odds Ratio	95% C.I. <sup>†</sup>	p-value <sup>‡</sup>
<b>Comorbidity</b>												
Yes	2.23	(1.07, 4.62)	0.032*	2.87	(0.85, 9.65)	0.088	4.63	(1.47, 14.6)	0.009*	5.55	(0.8, 11.79)	0.105
No	1	---		1	---		1	---		1	---	
<b>Treatment received</b>												
Yes	1	---	0.011*	1	---	0.022*	1	---	0.02*	1	---	0.106
No	2.37	(1.22, 4.60)		3.41	(1.2, 9.71)		3.37	(1.21, 9.41)		3.55	(0.82, 7.93)	
<b>Level of disability</b>												
Mild	1	---		1	---		1	---		1	---	
Moderate	3.97	(1.34, 11.8)	0.001*	8.03	(1.42, 45.3)	0.017*	4.59	(1.22, 17.3)	0.036*	6.66	(1.1, 36.7)	0.045*
Severe	2.43	(0.8, 7.40)		3.96	(0.63, 24.8)		1.7	(0.41, 7.15)		2.11	(0.31, 14.0)	
Very Severe	17.5	(4.03, 75)		26.81	(2.62, 27.4)		7.6	(1.22, 47.4)		11.3	(1.2, 14.7)	
<b>Type of disability</b>												
Physical	1.93	(0.74, 5.01)	0.127	1.93	(0.39, 9.67)	0.704	1.68	(0.46, 6.19)	0.719	2.5	(0.4, 15.03)	0.478
Vision	0.85	(0.25, 2.91)		2.15	(0.30, 15.2)		1.39	(0.25, 7.78)		3.88	(0.43, 34.8)	
Hearing	1	---		1	---		1	---		1	---	
<b>Time of disability</b>												
Acquired	1.86	(1.01, 3.5)	0.054*	1.83	(0.65, 5.13)	0.253	2.12	(0.9, 4.96)	0.083	1.88	(0.41, 3.93)	0.672
At birth	1	---		1	---		1	---		1	---	

\* Statistically significant at  $\alpha = 0.05$

<sup>†</sup> CI Confidence interval

<sup>‡</sup> Likelihood Ratio Chi-square Test

## Discussion

The prevalence of depression among people with disabilities (39%) and those with borderline depression (29.9%), reported from this study, is higher than the national average (10%) among the general population, which shows depression as a legitimate concern among the disabled population [18]. A hospital-based study conducted on depression among 35 physically disabled individuals in Pakistan showed a 97% prevalence rate, higher than the findings of this study [12]. Another study conducted in Nepal among people with physical disabilities in a selected disability care home also reported a higher prevalence of depression at 77% [19]. These discrepancies in the findings could stem from the difference in study setting (community-based vs. institutional setting) and the cultural differences of the study population.

The study explored cursory factors associated with depression with a crude (unadjusted) analysis (see Table 3 and Supplementary Material Table S.2). The analysis showed a significant association between age (the older population aged 56-65 years had higher prevalence of depression than the younger population), similar to multiple studies reported in the literature [20–22]. A significant association was also observed with sex, with a higher prevalence of depression in females than males, in line with other studies [20–22]. The analysis also showed that physical activity, education level, satisfaction with life, and employment were negatively associated with depression. In contrast, experience of violence, time of onset of disability, having co-morbidity, and level of disability were positively associated. Violence is reported as a major problem in adults with disabilities by multiple studies [23–25]. A high prevalence of violence of 66.5% among people with disability was observed in this study. This is a major concern for disabled individuals and might warrant a detailed study of its own. Social stigma may help explain this high levels of

violence experienced by this vulnerable population. Respondents with better social participation showed less depression, similar to prior research [22]. Economic status also significantly influenced depression, with poorer individuals reporting a higher prevalence, consistent with other studies [14,22,26]. The analysis shows a higher prevalence of depression among those who were not physically active. Similarly, findings are reported in the literature [27–29]. As the scope of this study is the analysis of the association of depression with disease and disability status, all these significant factors discussed above were controlled in adjusted models.

Depression is a major risk factor for suicide, and in this study, we observed 49.4% of the respondents with suicidal ideation, of which 8.5% had attempted suicide [30]. This is significantly higher than reported in a study by Nosek et al., which showed a 20% prevalence of suicidal ideation [31]. The difference may be attributed by the factor that the study was conducted only among females in a different socio-cultural setting.

Individuals with comorbidities had significantly higher odds of depression which is consistent with findings from another study in Pakistan [32]. The association of comorbidity and depression was significant at a 0.05 level of significance after adjusting for individual-level factors. This suggests that comorbidity is a strong predictor of depression; the presence of pre-diagnosed diseases other than disabilities also influences the mental health status of the individual with disabilities. However, the association was not significant at the same significance level when adjusted for both individual and family/community level factors. This suggests potential interaction in the association of comorbidity and depression by family/community level factors, which was not assessed in this study and should be explored further in future research.

Treatment accessibility was found to be significantly associated with depression in an unadjusted model as well as the adjusted Model 2 (adjusted for individual-level factors) and Model 3 (adjusted for family/community-level factors), which is consistent with findings from Shen et al. 2017 [22].

This study shows poor mental health among those who are deprived of health services. Access to medical care is likely to be affected by the economic and social conditions of the respondent. The study reported about 59% of respondents without access to care, which is a concern that needs serious attention.

Though higher odds of depression were seen among people with physical disabilities, no significant association between the type of disability and depression was observed. A statistically significant association between the level of disability and depression was observed in both unadjusted and adjusted analyses, which indicates that the severity of the disability is a crucial factor influencing depression. Those with very severe disabilities were the most vulnerable ones and had higher odds of depression than those with mild disabilities. This might be because individuals with mild levels of disabilities have better physical performance and fewer activity limitations than those with severe or very severe levels of disabilities. Similar to this result, several studies also showed that the overall odds of depression were markedly lower in people with better physical performance or less functional disability [26,33].

Disabilities acquired later in life had higher odds of having depression than those with disabilities from birth. The association of time of disabilities and depression was statistically significant in unadjusted analysis. However, this association was statistically insignificant after adjusting for sociodemographic factors (individual-level, family/community-level, or both). This suggests some

influence of sociodemographic factors in the crude association between the timing of disability and depression.

This study assessed the under-explored and stigmatized matter of depression among people with disabilities. To the best of our knowledge, this type of community-based study focusing on the mental health of individuals with different disability types is limited in the context of Nepal. The majority of the studies are conducted in an institutional setting and focus on a single type of disability. This community-based study includes people with multiple disability types. The study is limited to one rural municipality of Nepal and only includes the people with disabilities listed on the municipality disability list and does not consider people not in the listed records. Another major limitation of the study is that it has no comparison group, as it was focused more on assessing the magnitude of the problem among people with disabilities rather than comparison with the general population. A large-scale study on the mental health of people with disabilities is recommended to grab a globally representative scenario.

**Conclusion**

The study showed that out of 164 people with disabilities in Ilam municipality, 39% of the respondents had depression, and about one-third of participants were in borderline depression. In an analysis of the association between disability, disease status, and depression after adjusting for various levels of sociodemographic factors, the level of disability was a significant factor contributing to depression. Likewise, based on different models, having preexisting disease conditions other than disability and service accessibility (treatment status) for the existing conditions were found to have significant contributions to depression among individuals with disabilities. Findings from the study revealed that both the individual and family/community-level

factors together have strong influence in depression among individuals with disabilities. Therefore, these factors should be considered in planning and strategy development to improve health, enhance well-being, and prevent depression among people with disabilities.

### **Ethical approval**

Ethical approval was obtained from the institutional review committee of Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal; MMIHS IRC 320. Informed written consent was taken from each participant after explaining the objective of the study.

### **Data Availability**

Additional data can be provided upon request to the corresponding author.

### **Funding**

This study has not been financially supported by any organization.

### **Conflict of Interest**

The authors declare that there is no conflict of interest regarding the publication of this paper.

### **Contributors:**

Conceptualization: Apekshya Ghimire, Durga K. Mishra; Methodology: Apekshya Ghimire; Formal analysis and investigation: Apekshya Ghimire; Writing - original draft preparation: Apekshya Ghimire; Writing - review and editing: Apekshya Ghimire, Durga K. Mishra; Resources: Apekshya Ghimire, Durga K. Mishra; Supervision: Durga K. Mishra

Apekshya Ghimire is the guarantor for the study.



**Acknowledgments**

We want to acknowledge the reviewers and editors for all the constructive and insightful comments on the manuscript. We heartily appreciate Mr. Albert Dahal for his help in review editing the manuscript. We would like to heartily thank all the participants of this study, the faculty members of the Department of Public Health, Manmohan Memorial Institute of Health Sciences, Ilam municipality, and Karuna Foundation Nepal for their support.

**References**

1. World Health Organization. International classification of impairments, disabilities, and handicaps : a manual of classification relating to the consequences of disease, published in accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, May 1976 [Internet]. World Health Organization; 1980 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/41003>
2. World Health Organization. WHO fact sheet on disability and health. 2023 [cited 2024 Oct 10]. Disability. Available from: <https://www.who.int/news-room/fact-sheets/detail/disability-and-health>
3. World Health Organization. WHO global disability action plan 2014-2021: better health for all people with disability [Internet]. World Health Organization; 2015 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/199544>
4. Mushtaq S, Akhouri D. Self esteem, anxiety, depression and stress among physically disabled people. International Journal of Indian Psychology. 2016;3(4):64.
5. WHO EMRO | Depression: Let's talk | World Health Day 2017 | World Health Days [Internet]. [cited 2021 Jun 14]. Available from: <http://www.emro.who.int/world-health-days/world-health-day-2017/depression-lets-talk.html>
6. Organization WH. Depression and other common mental disorders: global health estimates. 2017 [cited 2021 Jun 14]; Available from: <https://apps.who.int/iris/handle/10665/254610>
7. Noh JW, Kwon YD, Park J, Oh IH, Kim J. Relationship between Physical Disability and Depression by Gender: A Panel Regression Model. PLOS ONE. 2016 Nov 30;11(11):e0166238.
8. Hollon SD, Cohen ZD, Singla DR, Andrews PW. Recent Developments in the Treatment of Depression. Behav Ther. 2019 Mar;50(2):257–69.

9. Bradley SM, Rumsfeld JS. Depression and cardiovascular disease. *Trends Cardiovasc Med*. 2015 Oct;25(7):614–22.
10. Krittanawong C, Maitra NS, Qadeer YK, Wang Z, Fogg S, Storch EA, et al. Association of Depression and Cardiovascular Disease. *The American Journal of Medicine*. 2023 Sep 1;136(9):881–95.
11. Yokoya S, Maeno T, Sakamoto N, Goto R, Maeno T. A Brief Survey of Public Knowledge and Stigma Towards Depression. *J Clin Med Res*. 2018 Mar;10(3):202–9.
12. Hussain N, Sikander M, Maqsood M. Level of Depression in Physically Disabled. 2014;5.
13. Aneshensel CS, Frerichs RR, Huba GJ. Depression and Physical Illness: A Multiwave, Nonrecursive Causal Model. *Journal of Health and Social Behavior*. 1984;25(4):350–71.
14. Jones KH, Jones PA, Middleton RM, Ford DV, Tuite-Dalton K, Lockhart-Jones H, et al. Physical Disability, Anxiety and Depression in People with MS: An Internet-Based Survey via the UK MS Register. *PLoS One*. 2014 Aug 25;9(8):e104604.
15. Zhou L, Wang W, Ma X. The bidirectional association between the disability in activities of daily living and depression: a longitudinal study in Chinese middle-aged and older adults. *BMC Public Health*. 2024 Jul 15;24(1):1884.
16. Jiang C hong, Zhu F, Qin T ting. Relationships between Chronic Diseases and Depression among Middle-aged and Elderly People in China: A Prospective Study from CHARLS. *CURR MED SCI*. 2020 Oct 1;40(5):858–70.
17. Risal A, Manandhar K, Linde M, Koju R, Steiner TJ, Holen A. Reliability and Validity of a Nepali-language Version of the Hospital Anxiety and Depression Scale (HADS). *Kathmandu Univ Med J (KUMJ)*. 2015 Jun;13(50):115–24.
18. Jha DAK, Ojha DSP. National Mental Health Survey Team. Nepal Health Research Council [Internet]. 2020; Available from: <https://nhrc.gov.np/wp-content/uploads/2022/10/National-Mental-Health-Survey-Report2020.pdf>
19. Karki P, Shahi PV, Sapkota KP, Bhandari R, Adhikari N, Shrestha B. Depressive symptoms and associated factors among persons with physical disabilities in disability care homes of Kathmandu district, Nepal: A mixed method study. *PLOS Global Public Health*. 2023 Jan 12;3(1):e0001461.
20. Al-Abbudi S, Ezzat K, Zebala A, Hamdy D, Beedany M, Farhan M. Prevalence and Determinants of Depression Among Traumatic Spinal Cord Injured Patients Attending Ibn-Al-Quff Hospital, Baghdad, Iraq. *Journal of Psychiatry*. 2017 Jan 1;20.

21. Zaidi SM. COMORBIDITY OF PHYSICAL DISABILITY WITH DEPRESSION AND ANXIETY. *International Journal of Environment, Ecology, Family and Urban Studies (IJEEFUS)*. 2013 Mar 30;3:79–86.

22. Shen SC, Huang KH, Kung PT, Chiu LT, Tsai WC. Incidence, risk, and associated factors of depression in adults with physical and sensory disabilities: A nationwide population-based study. *PLoS One*. 2017 Mar 31;12(3):e0175141.

23. Montesó-Curto P, Aguilar C, Lejeune M, Casadó-Marin L, Casanova Garrigós G, Ferré-Grau C. Violence and depression in a community sample. *J Clin Nurs*. 2017 Aug;26(15–16):2392–8.

24. Olofsson N, Lindqvist K, Danielsson I. Higher risk of violence exposure in men and women with physical or sensory disabilities: results from a public health survey. *J Interpers Violence*. 2015 Jun;30(10):1671–86.

25. Hughes K, Bellis MA, Jones L, Wood S, Bates G, Eckley L, et al. Prevalence and risk of violence against adults with disabilities: a systematic review and meta-analysis of observational studies. *Lancet*. 2012 Apr 28;379(9826):1621–9.

26. Gale CR, Sayer AA, Cooper C, Dennison EM, Starr JM, Whalley LJ, et al. Factors associated with symptoms of anxiety and depression in five cohorts of community-based older people: the HALCyon (Healthy Ageing across the Life Course) Programme. *Psychol Med*. 2011 Oct;41(10):2057–73.

27. Okoro CA, Strine TW, Balluz LS, Crews JE, Mokdad AH. Prevalence and correlates of depressive symptoms among United States adults with disabilities using assistive technology. *Prev Med*. 2010 Apr;50(4):204–9.

28. Rask S, Castaneda AE, Koponen P, Sainio P, Stenholm S, Suvisaari J, et al. The association between mental health symptoms and mobility limitation among Russian, Somali and Kurdish migrants: a population based study. *BMC Public Health*. 2015 Mar 20;15:275.

29. De Mello MT, Lemos V de A, Antunes HKM, Bittencourt L, Santos-Silva R, Tufik S. Relationship between physical activity and depression and anxiety symptoms: a population study. *J Affect Disord*. 2013 Jul;149(1–3):241–6.

30. Choi SB, Lee W, Yoon JH, Won JU, Kim DW. Risk factors of suicide attempt among people with suicidal ideation in South Korea: a cross-sectional study. *BMC Public Health*. 2017 Dec;17(1):579.

31. Nosek MA, Hughes RB, Robinson-Whelen S. The complex array of antecedents of depression in women with physical disabilities: implications for clinicians. *Disabil Rehabil*. 2008;30(3):174–83.

- 1  
2  
3 32. Maqsood F, Flatt JD, Albert SM, Maqsood S, Nizamuddin M. Correlates of Self-Reported  
4 Depressive Symptoms: A Study of Older Persons of Punjab, Pakistan. *J Cross Cult Gerontol*.  
5 2013 Mar;28(1):65–74.  
6  
7  
8 33. Asdaq SMB, Alshehri S, Alajlan SA, Almutiri AA, Alanazi AKR. Depression in persons  
9 with disabilities: a scoping review. *Front Public Health* [Internet]. 2024 May 7 [cited 2025  
10 Jan 19];12. Available from: [https://www.frontiersin.org/journals/public-](https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2024.1383078/full)  
11 [health/articles/10.3389/fpubh.2024.1383078/full](https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2024.1383078/full)  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39  
40  
41  
42  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60

For peer review only

Table S.1: Distribution of participant’s socio-demographic characteristics

Variables	Frequency	Percentage
<b>Age (n= 164)</b>		
Mean ± SD	38.37 ± 15.75	
Range	18-65	
18-35	82	50
36-55	50	30.5
56-65	32	19.5
<b>Sex (n= 164)</b>		
Male	95	57.9
Female	69	42.1
<b>Marital status (n= 164)</b>		
Unmarried	91	55.5
Married	73	44.5
<b>Family type (n= 164)</b>		
Nuclear	68	41.5
Joint	96	58.5
<b>Education status (n= 164)</b>		
Illiterate	52	31.7
Literate	37	22.6
Formal education	75	45.7
<b>Employment (n= 164)</b>		

Unemployed	63	38.4
Employed	29	17.7
Housemakers	26	15.8
Students	19	11.6
Agriculture	27	16.5
<b>Economic status (n= 164)</b>		
Below poverty	84	51.2
Above poverty	80	48.7
<b>Experience of violence (n= 164)</b>		
Yes	109	66.5
No	55	33.5
<b>Types of violence (n = 109)*</b>		
Physical	20	21.1
Sexual	6	6.3
Mental	89	93.7
Emotional	94	98.9
Deprivation	54	20.5
<b>Involvement in social function (n= 164)</b>		
Almost every function	26	15.9
Sometimes	72	43.9

Never	66	40.2
<b>Assistive device (n= 164)</b>		
Yes	62	37.8
No	102	62.2
<b>Physical activity (n= 164)</b>		
Never	63	38.4
Sometimes	47	28.7
Regular	54	32.9
<b>Substance abuse (n= 164)</b>		
Yes	47	28.7
No	117	71.3
<b>Types of substance abuse*</b>		
(n=47)		
Alcohol	19	40.4
Smoking	46	97.9
Other	2	4.2

\*=multiple responses recorded where participants provided more than one categories of response

Table S.2: Association of participant's characteristics with depression

Variables	Depression (%)	No Depression (%)	P-value
<b>Age (n= 164)</b>			
18-35	23 (28%)	59 (72%)	0.001
36-55	19 (38.8%)	30 (61.2%)	
56-65	22 (66.7%)	11 (33.3%)	
<b>Sex (n= 164)</b>			
Male	29 (30.5%)	66 (69.5%)	0.009
Female	35 (50.7%)	34 (49.3%)	
<b>Marital status (n= 164)</b>			
Married	35 (47.9%)	38 (52.1%)	0.36
Unmarried	29 (31.9%)	62 (68.1%)	
<b>Family type (n= 164)</b>			
Nuclear	27 (39.7%)	41 (60.3%)	0.88
Joint	37 (38.5%)	59 (61.5%)	
<b>Education status (n= 164)</b>			
Illiterate	33 (63.5%)	19 (36.5%)	<0.001
Literate	17 (45.9%)	20 (54.1%)	
Formal education	14 (18.7%)	61 (81.3%)	
<b>Employment (n= 164)</b>			
Unemployed	32 (50.8%)	31 (49.2%)	< 0.001



Employed	7 (24.1%)	22 (75.9%)	
Housemakers	17 (65.4%)	9 (34.6%)	
Students	2 (10.5%)	17 (89.5%)	
Agriculture	6 (22.2%)	21 (77.8%)	
<b>Economic status (n= 164)</b>			
Below poverty	50 (59.5%)	34 (40.5%)	< 0.001
Above poverty	14 (17.5%)	66 (82.5%)	
<b>Experience of violence (n= 164)</b>			
Yes	52 (47.7%)	57 (52.3%)	0.001
No	12 (21.8%)	43 (78.2%)	
<b>Involvement in social function (n= 164)</b>			
Almost every function	3 (11.5%)	23 (88.5%)	<0.001
Sometimes	22 (30.6%)	50 (69.4%)	
Never	39 (59.1%)	27 (40.9%)	
<b>Assistive device (n= 164)</b>			
Yes	24 (38.7%)	38 (61.3%)	0.949
No	40 (39.2%)	62 (60.8%)	
<b>Physical activity (n= 164)</b>			
Never	35 (55.6%)	28 (44.4%)	0.001
Sometimes	17 (36.2%)	30 (63.8%)	
Regular	12 (22.2%)	42 (77.8%)	

**Substance abuse** (n= 164)

Yes	23 (48.9%)	24 (51.1%)	0.099
No	41 (35%)	76 (65%)	

For peer review only

# BMJ Open

## Depression among individuals with disabilities: a community-based cross-sectional study in Nepal

Journal:	<i>BMJ Open</i>
Manuscript ID	bmjopen-2023-082955.R3
Article Type:	Original research
Date Submitted by the Author:	08-Feb-2025
Complete List of Authors:	Ghimire, Apekshya; Manmohan Memorial Institute of Health Sciences, Department of Public Health Mishra, Durga Kumari Khadka; Manmohan Memorial Institute of Health Sciences, Department of Public Health
<b>Primary Subject Heading</b>:	Public health
Secondary Subject Heading:	Public health, Mental health
Keywords:	PUBLIC HEALTH, MENTAL HEALTH, Depression & mood disorders < PSYCHIATRY, Disabled Persons, Nepal, Cross-Sectional Studies

SCHOLARONE™  
Manuscripts



I, the Submitting Author has the right to grant and does grant on behalf of all authors of the Work (as defined in the below author licence), an exclusive licence and/or a non-exclusive licence for contributions from authors who are: i) UK Crown employees; ii) where BMJ has agreed a CC-BY licence shall apply, and/or iii) in accordance with the terms applicable for US Federal Government officers or employees acting as part of their official duties; on a worldwide, perpetual, irrevocable, royalty-free basis to BMJ Publishing Group Ltd ("BMJ") its licensees and where the relevant Journal is co-owned by BMJ to the co-owners of the Journal, to publish the Work in this journal and any other BMJ products and to exploit all rights, as set out in our [licence](#).

The Submitting Author accepts and understands that any supply made under these terms is made by BMJ to the Submitting Author unless you are acting as an employee on behalf of your employer or a postgraduate student of an affiliated institution which is paying any applicable article publishing charge ("APC") for Open Access articles. Where the Submitting Author wishes to make the Work available on an Open Access basis (and intends to pay the relevant APC), the terms of reuse of such Open Access shall be governed by a Creative Commons licence – details of these licences and which [Creative Commons](#) licence will apply to this Work are set out in our licence referred to above.

Other than as permitted in any relevant BMJ Author's Self Archiving Policies, I confirm this Work has not been accepted for publication elsewhere, is not being considered for publication elsewhere and does not duplicate material already published. I confirm all authors consent to publication of this Work and authorise the granting of this licence.

Protected by copyright, including for uses related to text and data mining, AI training, and similar technologies. Enseignement Supérieur (ABES).

# Depression among individuals with disabilities: a community-based cross-sectional study in Nepal

Apekshya Ghimire<sup>1</sup>, Durga Khadka Mishra<sup>1</sup>

<sup>1</sup>Department of Public Health, Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal

Correspondence to:

Apekshya Ghimire

[apekshyaghimire9@gmail.com](mailto:apekshyaghimire9@gmail.com)

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

26

27

28

29

30

31

32

33

34

35

36

37

38

39

40

41

42

43

44

45

46

47

48

49

50

51

52

53

54

55

56

57

58

59

60

# ABSTRACT

## Objective

To assess the prevalence of depression and its associated factors among people with disabilities.

## Design

Cross-sectional study.

## Setting

Community-based study conducted in Ilam municipality, Nepal, from October to November 2019.

## Participants

The study was conducted among 164 people with physical, hearing, and vision-related disabilities. Participants were selected using a simple random sampling method using the sampling frame obtained from Ilam municipality.

## Main outcome measure

Depression and its associated factors among people with disabilities. Depression assessed via a validated Nepali version of the Hospital Anxiety and Depression Scale (HADS-D). Data collection was based on a pre-tested structured questionnaire.

## Results

The prevalence of depression was 39% among people with disabilities, and 29.9 % of the respondents were in borderline depression. In an unadjusted analysis, depression was significantly ( $p < 0.05$ ) associated with comorbidities, absence of medical intervention, severe disabilities, and

disabilities acquired at birth. After adjusting for individual-level factors (age, sex, education, employment, and physical activities), the level of disability and treatment accessibility were significantly associated with depression. After adjusting for family and community-level factors (economic status, experience of violence, and social participation), depression remained significantly associated ( $p < 0.05$ ) with having comorbidities, absence of medical intervention, and presence of very severe disabilities. When adjusting for both individual- and community-level factors, the level of disability continued to show a significant association with depression (odds ratio 6.36 (moderate vs mild), 2.11 (severe vs. mild), and 13.3 (very severe vs. mild) [overall p-value 0.045]). Across all three adjusted models, the level of disability was significantly associated with depression ( $p < 0.05$ ).

## Conclusion

Depression is one of the major global public health concerns, with people with disabilities being particularly vulnerable. Ensuring the health and wellbeing of people with disabilities requires focused attention and strategic planning, emphasizing disease prevention, health promotion, and improved access to care.

## Keywords

People with disabilities, physical disabilities, hard of hearing, vision-related disabilities, Depression

### Strengths and limitations of this study

- This was a community-based study that included people with different types of disabilities.
- This study has no comparison group.
- The study was conducted among individuals with disabilities listed in the Ilam municipality's records; it does not include individuals with disabilities who were not listed.



## INTRODUCTION

Disability refers to a lack of ability or restriction in performing activities due to impairment. These activities may include interpersonal relations, work, physical, mental, and intellectual functions [1]. Disability is a growing public health challenge, affecting an increasing number of people annually. In 2023, approximately 1.3 billion people (16% of the global population) were estimated to have severe disabilities [2]. This rising burden is largely attributed to the growing prevalence of non-communicable diseases, genetic factors, complications during childbirth, and delays in the diagnosis and treatment of underlying conditions leading to disability. In this study, "disability" is used as an umbrella term encompassing impairments, activity limitations, and participation restrictions among individuals with physical, visual, and hearing impairments.

Everyone is likely to experience some form of disability at some point in their life, especially as they age [3]. Despite the widespread prevalence of disability, individuals with disabilities often face stigmatization, discrimination, inequalities, and restrictions on participation. Their rights and dignity are frequently violated through acts of violence, abuse, and disrespect—barriers that are entirely preventable [3]. These challenges, coupled with emotional distress, further predispose the development of mental disorders among individuals with disabilities [3,4].

Depression is a common mental disorder characterized by persistent sadness, loss of interest or pleasure, feelings of guilt or low self-worth, disturbed sleep or appetite, tiredness, and poor concentration [5,6]. People with disabilities are three times more likely to experience depression compared to the general population [7]. Globally, an estimated 322 million people are living with depression, which is one of the leading causes of disability worldwide and directly impacts an individual's quality of life [5,8–10]. Both depression and disability are highly stigmatized in our

society [7,11]. A 2014 study conducted in Pakistan among permanently disabled individuals found that 42.86% had moderate depression, 37.14% had severe depression, and 14.29% had extreme depression [12]. Likewise, multiple studies on depression and physical illness have shown a positive correlation between depression and physical disability [13,14]. A recent study in India reported a higher score of depression among individuals with disabilities (18.5) compared to the general population (7.2) [4].

The relationship between depression and disability is bidirectional: depression significantly increases the risk of activity limitations, while disability and activity limitations also have a substantial, time-dependent impact on depression [15,16]. Community-based studies on depression among people with different disabilities are limited, especially in Nepal. This study aims to assess the prevalence of depression and related factors among people with disabilities in a selected Nepalese municipality. The findings will support the development of mental health intervention and aid policymakers in addressing mental health needs within this population.

## METHODS

### Study population

A community-based cross-sectional study was conducted among 164 people with disabilities in Ilam municipality of Province 1, Nepal, from October to November 2019. The study aimed to assess the prevalence of depression and its associated factors among individuals with disabilities. A quantitative research method was used, with the individual as the study unit. Since the study was carried out among people with disabilities, not every participant could complete the survey questionnaire by themselves. Therefore, a face-to-face interview technique was used to collect data

about depression status, disease status, disability, and other covariates by asking the participants the structured survey questions and recording their responses.

The sample size was determined using the formula for finite population developed by Cochran in 1963:

$$n = \frac{Z^2 pq}{d^2 + \frac{Z^2 pq}{N}}$$

Where:

n = desired sample size

Z = standard normal deviation, set at 1.96, corresponding to 95% confidence level

p = proportion of target population estimated to have a particular characteristic. Since data on the prevalence of anxiety and depression among people with disabilities in Nepal or similar regions was unavailable, a prevalence rate of p = 50% was assumed.

q = 1-p

N = 243 (Number of individuals with physical disabilities, hearing impairments, and vision-related disabilities obtained from Ilam municipality records.)

d = degree of accuracy required, usually set at 5%

Therefore,

$$n = \frac{(1.96)^2 \times 0.5 \times 0.5}{(0.05)^2 + \frac{(1.96)^2 \times 0.5 \times 0.5}{243}}$$

n = 149

Considering non-response rate of 10%, the final sample size was calculated to be:

$$149 + 10\% \text{ of } 149 = 164$$

The sample size of n=164 was selected from a sampling frame of 243 people obtained from the health section of the Ilam municipality office, using random sampling with a lottery method. The study achieved a 100% response rate, with all 164 selected individuals consenting to participate and successfully completing the survey.

### **Inclusion and exclusion criteria**

The study included individuals aged 18-65 years, while those unable to complete the survey due to communication difficulties were excluded. Inclusion criteria were verified using the municipality records.

### **Data collection tools and techniques**

Face-to-face interviews were conducted using a pre-tested structured questionnaire to assess the socio-demographic characteristics of the study population. Depression was measured using a validated Nepali version of the Hospital Anxiety and Depression Scale (HADS-D) [17]. While the original English version of HADS-D has a reported Cronbach's alpha of 0.82 [18], the Nepali language adapted version of the tool has reported a satisfactory construct validity and Cronbach's alpha of 0.68 [17].

### **Study variables**

#### ***Outcome variables***

A validated Nepali version of the standard Hospital Anxiety and Depression Scale (HADS-D) was used to assess depression, the primary outcome variable. The HADS is a 14-item, 4-point scale that assesses how respondents have been feeling in the past 7 days. The depression subscale (HADS-D) has seven items, each item's score ranging from 0-3, with 3 indicating higher severity of the particular depressive symptom, with the total summed score ranging from 0-21. A HADS-D score of 11 was used as the cutoff for assessing depression, with scores of 11 or higher classified as indicating depression, scores between 7 and 10 considered borderline depression, and scores below 7 classified as normal [17]. The primary outcome variable, depression, was classified as Yes (HADS-D score  $\geq 11$ ) or No (HADS-D score  $\leq 10$ ). Respondents also reported other depressive symptoms like suicidal ideation or attempts and recent stressful life events (also categorized as Yes or No).

### ***Primary independent variables***

Our primary independent variables were the disability and disease status of the participants. Disability was defined based on the classification criteria provided by the Central Bureau of Statistics (CBS), Nepal, categorized into physical disabilities, hard of hearing, and vision-related disabilities. Each category was further classified into four different severity levels – very severe (profound), severe, moderate, and mild – following Nepal Law Commission guidelines. Participants indicated their type of disabilities, severity level, and time of onset of disability (from birth or acquired later in life) in the completed questionnaire, based on the disability card from government of Nepal.

Profound disability is a condition where a person has difficulty performing their day-to-day activities even with the continuous support of others. Severe disability is defined as a condition

where people need continuous support from others to perform personal activities and to participate in social activities. Moderate disability is defined as a condition where a person can regularly participate in their daily and social activities if a physical facility is available, environmental barrier is ended, or education or training is provided. Mild disability is defined as a condition where a person can regularly participate in their daily and social activities if no physical or environmental barrier exists.

To assess disease status, respondents were asked if they had been diagnosed with any health condition (Yes or No). Respondents answering “Yes” were further asked to specify the diagnosed condition (Hypertension, Diabetes, Cancer, Others). Respondents also reported whether they have been receiving any medical care.

### *Covariates*

Sociodemographic variables were classified into individual-level and family/community-level variables. Individual-level variables included in the study are: *Age in completed years* (Categorized as 18-35, 36-55, and 56- 65), *Sex* (Categorized as Male or Female), *Education level* (Categorized as Illiterate, Literate, or Formal education), *Employment status* (Categorized as Employed, Housemakers, Agriculture, Student, or Unemployed), *Physical activity* (Categorized as Never, Sometimes, or Regular, based on WHO physical activity criterion), *Substance abuse status* (Yes (alcohol, smoking, or drugs) or No).

Likewise, the family/community-level variables considered in the study included *Experience of violence* (Yes or No), *Social participation level* (Categorized as Almost every function, Sometimes, or Never), *Economic status* (Categorized as Below or Above poverty level, based on

the per-capita income in the family). The threshold poverty level was defined as less than 1.90 \$ per day based on the World Bank's socioeconomic status category. All household income sources were identified and divided by the number of family members to calculate the per-capita income. Respondents also reported their *Family type* (Categorized as Nuclear or Joint/Extended). A nuclear family was defined as families consisting of parents and children living together. The joint/extended family type is where grandparents, parents, and children are living together.

### Pre-testing

Pre-testing was done in Mahalaxmi municipality among 20 people with disabilities. Content and face validity were maintained through extensive literature review and expert consultation.

### Data analysis

We entered and analyzed the data in Statistical Package for Social Science (SPSS IBM v. 22) and SAS v. 9.4. Descriptive analysis for all variables is presented as frequency and percentage. The Chi-square test (at a 5% significance level and 95% CI) assessed the unadjusted association between dependent and independent variables. The independent variables with significant association ( $p\text{-value} < 0.05$ ) in the unadjusted analysis were adjusted in the subsequent models. Variables for suicidal ideation and attempts, and satisfaction with life were removed from the models as they might also represent the symptoms of depression. The association of primary independent variables (disability and disease status) and outcome variable (depression) adjusted for the sociodemographic variables was calculated using three logistic regression models. Model 1 is the crude model with no adjustment; Model 2 adjusts for individual-level socio-demographic factors (age, education, employment, physical activity status); Model 3 adjusts for



family/community-level sociodemographic factors (social participation, experience of violence, and economic status), and Model 4 adjusts for both the individual and family/community level socio-demographic variables.

**Patient and public involvement**

During the initial phase of the study, representative people with disabilities from the National Federation of the Disabled, Nepal, were consulted, and their suggestions were incorporated into the study. After publication, the findings from the study will be disseminated to people with disabilities and organizations working to assist them.

**RESULTS**

**Sociodemographic characteristics**

Supplementary Table S1 shows the distribution of the participants' sociodemographic characteristics. The mean age of the participants was  $38.37 \pm 15.75$  years, with a majority (57.9%) being male. The majority (55.5%) were unmarried, and 48.5% of the respondents lived in a joint family. Regarding education, 31.7% of the respondents were illiterate, 22.6% were literate without formal education, and (45.7%) had formal education. Unemployment was reported by 38.4% of the respondents, while 11.6% were students. More than half of the respondents (51.2%) lived below the poverty level. The majority (66.5%) of the respondents experienced violence. Among those who experienced violence, 98.9% reported experiencing emotional and 93.7% reported experiencing mental violence. Regarding social participation, 40.2% of respondents reported never attending any social functions. The majority (62.2%) did not use any assistive devices. Most (38.4%) of the respondents never did any physical activity. Among the respondents (28.7%) who



reported 'Yes' to substance abuse practice, 97.9% of the respondents were smokers. The detailed demographic data is reported in Supplementary Table S1.

### Depressive symptoms

**Error! Reference source not found.** Table 1 shows the depressive symptoms of the respondents. Depression was identified in 39% of the respondents; 29.9% were in borderline depression, while only 31.1% of the respondents were normal. The majority (80%) of the respondents reported having no stressful life events in the past. Most (69.5%) of the respondents were not satisfied with their life. Almost half (49.5%) of the respondents had suicidal ideation, and 8.5% had attempted suicide in the past.

**Table 1.** Depressive symptoms

Variables	Frequency	Percentage
<b>Prevalence of depression (n= 164)</b>		
Depression	64	39
No Depression	100	61
<b>Level of depression (n= 164)</b>		
Depression	64	39
Borderline	49	29.9
Normal	51	31.1
<b>Stressful life events (n= 164)</b>		
Yes	32	19.5
No	132	80.5
<b>Satisfaction with life (n= 164)</b>		
Yes	50	30.5
No	114	69.5

<b>Suicidal ideation (n= 164)</b>		
<b>Yes</b>	81	49.4
<b>No</b>	83	50.6
<b>Suicidal attempts (n= 164)</b>		
<b>Yes</b>	14	8.5
<b>No</b>	150	91.5

**Disability and disease status**

**Table 2** shows the disability and disease status of the respondents. Most (68.9%) of the respondents had physical disabilities, 16.5% had vision-related disabilities, and 14.6% had hard of hearing. Severe and moderate disabilities were most common (33.5% and 37.2%, respectively) among the respondents, and 18% had mild disability, while 11% of the respondents had very severe disability. Half of the respondents had a disability at birth, and half acquired disabilities after birth. About 24% of the respondents had some form of co-morbidity. Among those a majority (53.8 %) reported having hypertension. Despite the prevalence of co-morbidities, more than half (58.5%) reported having no treatment.

**Table 2.** Disability and disease status

<b>Variables</b>	<b>Frequency</b>	<b>Percentage</b>
<b>Type of disability (n= 164)</b>		
<b>Physical</b>	113	68.9
<b>Vision</b>	27	16.5
<b>Hard of hearing</b>	24	14.6
<b>Level of disability (n= 164)</b>		

<b>Very severe</b>	18	11.0
<b>Severe</b>	55	33.5
<b>Moderate</b>	61	37.2
<b>Mild</b>	30	18.3
<b>Duration of disability (n= 164)</b>		
<b>After birth</b>	82	50.0
<b>By Birth</b>	82	50.0
<b>Co-morbidity(n= 164)</b>		
<b>Yes</b>	39	23.8
<b>No</b>	125	76.2
<b>Disease (n=39) *</b>		
<b>Hypertension</b>	21	53.8
<b>Diabetes</b>	9	17.6
<b>Cancer</b>	3	5.9
<b>Others</b>	18	35.3
<b>Treatment received (n= 164)</b>		
<b>Yes</b>	68	41.5
<b>No</b>	96	58.5

\* Multiple responses reported by some participants.

### Association of respondents' characteristics and depression

The association between participants' sociodemographic characteristics and depression following a crude Chi-square analysis are shown in Supplementary Table S2. Age ( $p = 0.001$ ), sex ( $p = 0.009$ ), education status ( $p < 0.001$ ), employment ( $p < 0.001$ ), economic status ( $p < 0.001$ ) were found to be significantly associated with depression. Likewise, experience of violence ( $p = 0.001$ ), social participation ( $p < 0.001$ ), and physical activity ( $p = 0.001$ ) were found to be significantly

associated with depression. Depression was observed higher in older age groups (56-65 years) in comparison to younger age groups (see Supplementary Table S2).

Association of disability, disease status, and depression

The unadjusted association of disability, disease status, and depression is shown in **Table 3**. The level of disability was found to be significantly associated with depression ( $p < 0.001$ ). Depression was observed to be higher among those with very severe levels of disability. Reported co-morbidity ( $p = 0.030$ ), treatment received for existing conditions ( $p = 0.010$ ), satisfaction with life ( $p < 0.001$ ), and suicidal ideation ( $p < 0.001$ ) were found to be significantly associated with depression.

**Table 3.** Unadjusted association of disability, disease status, and depression

Variables	Depression (%)	No Depression (%)	P-value
Type of disability (n= 164)			
Physical	50 (44.2%)	63 (55.8%)	0.121
Vision	7 (25.9%)	20 (74.1%)	
Hard of hearing	7 (29.2%)	17 (74.1%)	
Level of disability (n= 164)			
Very severe	14 (77.8%)	4 (22.2%)	< 0.001
Severe	18 (32.7%)	37 (67.3%)	
Moderate	27 (44.3%)	34 (55.7%)	
Mild	5 (16.7%)	25 (83.3%)	
Duration of disability (n= 164)			
After birth	38 (46.3%)	44 (53.7%)	0.054
By Birth	26 (31.7%)	56 (68.3%)	
Co-morbidity (n= 164)			

Yes	21(53.8%)	18 (46.2%)	0.030
No	43 (34.4%)	82 (65.6%)	
Treatment received (n= 164)			
Yes	19 (27.5%)	50 (72.5%)	0.010
No	45 (47.4%)	50 (52.6%)	
Stressful life events (n= 164)			
Yes	14 (43.8%)	18 (56.3%)	0.541
No	50 (37.9%)	82 (62.1%)	
Satisfaction with life (n= 164)			
Yes	7 (14%)	43 (86%)	<0.001
No	57 (50%)	57 (50%)	
Suicidal ideation (n= 164)			
Yes	48 (59.3%)	33 (40.7%)	<0.001
No	16 (19.3%)	67 (80.7%)	
Suicidal attempts (n= 164)			
Yes	8 (57.1%)	6 (42.9%)	0.146
No	56 (37.3%)	94 (62.7%)	

**Table 4** shows the four different regression models assessing the association of disability and disease status with depression among people with disabilities. Model 2 was significant with pseudo- $R^2 = 38.1\%$ , Hosmer and Lemeshow significance = 0.31; model 3 was significant with pseudo- $R^2 = 33.68\%$ , Hosmer and Lemeshow significance = 0.94; and model 4 was significant with pseudo- $R^2 = 43.43\%$  and Hosmer and Lemeshow significance = 0.654. Variance Inflation Factors (VIFs) calculated for each independent variable in the model using the  $R^2$  value were less than 2 for all the variables in the model.

In the crude model, which did not adjust for any factors, disease status (comorbidity), treatment status, level of disability, and time of onset of disability were significantly associated with depression (p-value <0.05). Respondents with comorbidities had higher odds of depression compared to those without comorbidities (OR= 2.23). Health service access was another significant factor associated with depression, with those who did not receive medical care having higher odds of depression compared to those who were receiving care (OR= 2.37). The severity of disability was also a significant factor, with respondents with very severe, severe, and moderate disabilities having higher odds of depression (OR= 17.5, 2.43, 3.97, respectively) compared to those with mild disabilities. Respondents who acquired disability later in life had 1.9 times higher odds of depression than those who had disabilities at birth. However, the association of type of disability and depression was not significant at 0.05 level of significance.

Model 2 assessed the association of disability, disease status, and depression, adjusting for individual-level factors (age, sex, education, employment status, and physical activity level of the respondents). Treatment received was significantly associated with depression, with individuals not receiving any care having 3.41 times the odds of depression compared to those under some form of treatment. A similar association was observed with the level of disability, with very severe, severe, and moderate disabilities having 26.8, 3.96, and 8.03 times higher odds of depression, respectively, than those with mild depression.

Model 3 examined the association between disability, disease status, and depression, adjusting for family/community-level factors (economic status, experience of violence, and social participation). The model demonstrated a significant association of depression with the presence of comorbidities, treatment received, and the level of disabilities. Individuals with co-morbidities

had 4.63 times higher odds of depression than those without comorbidities (p-value = 0.009). Likewise, individuals receiving no treatment had 3.37 higher odds of depression compared to those under some form of treatment (p-value = 0.02). The association between the level of disability and depression was still significant in Model 3 consistent with Model 1 (crude model) and Model 2 (adjusted for individual-level factors). Individuals with very severe, severe, and moderate disabilities had 7.6, 1.7, and 4.59 times higher odds of depression, respectively, than those with mild levels of disability.

After adjusting for both individual-level and family/community-level factors in Model 4, only the level of disabilities was found to be significantly associated with depression, where those with very severe, severe, and moderate level disabilities had 13.3, 2.1, and 13.3 times the odds of depression among those with a mild level of disabilities.

Pseudo-  $R^2$  value of 36%, 33% and 43% were reported by Model 2, Model 3, and Model 4 respectively. This shows both the individual and family/community level factors together better predicts depression among individuals with disabilities.

**Table 4.** Association of disability, disease status, and depression (n=164)

Primary Independent Variables	Model 1			Model 2			Model 3			Model 4		
	Odds Ratio	95% C.I.†	p-value‡	Odds Ratio	95% C.I.†	p-value‡	Odds Ratio	95% C.I.†	p-value‡	Odds Ratio	95% C.I.†	p-value‡
<b>Comorbidity</b>												
Yes	2.23	(1.07, 4.62)	0.032*	2.87	(0.85, 9.65)	0.088	4.63	(1.47, 14.6)	0.009*	5.05	(0.8, 11.79)	0.105
No	1	---		1	---		1	---		1	---	
<b>Treatment received</b>												
Yes	1	---	0.011*	1	---	0.022*	1	---	0.02*	1	---	0.106
No	2.37	(1.22, 4.60)		3.41	(1.2, 9.71)		3.37	(1.21, 9.41)		3.55	(0.82, 7.93)	
<b>Level of disability</b>												
Mild	1	---		1	---		1	---		1	---	
Moderate	3.97	(1.34, 11.8)	0.001*	8.03	(1.42, 45.3)	0.017*	4.59	(1.22, 17.3)	0.036*	3.66	(1.1, 36.7)	0.045*
Severe	2.43	(0.8, 7.40)		3.96	(0.63, 24.8)		1.7	(0.41, 7.15)		1.1	(0.31, 14.0)	
Very Severe	17.5	(4.03, 75)		26.81	(2.62, 27.4)		7.6	(1.22, 47.4)		1.3	(1.2, 14.7)	
<b>Type of disability</b>												
Physical	1.93	(0.74, 5.01)	0.127	1.93	(0.39, 9.67)	0.704	1.68	(0.46, 6.19)	0.719	1.55	(0.4, 15.03)	0.478
Vision	0.85	(0.25, 2.91)		2.15	(0.30, 15.2)		1.39	(0.25, 7.78)		3.88	(0.43, 34.8)	
Hearing	1	---		1	---		1	---		1	---	
<b>Time of disability</b>												
Acquired	1.86	(1.01, 3.5)	0.054*	1.83	(0.65, 5.13)	0.253	2.12	(0.9, 4.96)	0.083	1.28	(0.41, 3.93)	0.672
At birth	1	---		1	---		1	---		1	---	

Model 1: Crude model without adjustment.

Model 2: Adjusted for individual-level socio-demographic factors.

Model 3: Adjusted for family/community-level socio-demographic factors.

Model 4: Adjusted for both individual-level and family/community-level socio-demographic factors.

\* Statistically significant at  $\alpha = 0.05$ .

† CI=confidence interval.

‡ Likelihood Ratio Chi-square Test.



## DISCUSSION

The prevalence of depression among people with disabilities (39%) and those with borderline depression (29.9%), reported from this study, is higher than the national average (10%) among the general population, which shows depression as a legitimate concern among the disabled population [19]. A hospital-based study conducted on depression among 35 physically disabled individuals in Pakistan showed a 97% prevalence rate, higher than the findings of this study [12]. Another study conducted in Nepal among people with physical disabilities in a selected disability care home also reported a higher prevalence of depression at 77% [20]. These discrepancies in the findings could stem from the difference in study setting (community-based vs. institutional setting) and the cultural differences of the study population.

The study explored cursory factors associated with depression with a crude (unadjusted) analysis (see **Table 3** and Supplementary Table S2). The analysis showed a significant association between age (the older population aged 56-65 years had higher prevalence of depression than the younger population), similar to multiple studies reported in the literature [21–23]. A significant association was also observed with sex, with a higher prevalence of depression in females than males, in line with other studies [21–23]. The analysis also showed that physical activity, education level, satisfaction with life, and employment were negatively associated with depression. In contrast, experience of violence, time of onset of disability, having co-morbidity, and level of disability were positively associated. Violence is reported as a major problem in adults with disabilities by multiple studies [24–26]. A high prevalence of violence of 66.5% among people with disability was observed in this study. This is a major concern for disabled individuals and might warrant a detailed study of its own. Social stigma may help explain these high levels of violence experienced

by this vulnerable population. Respondents with better social participation showed less depression, similar to prior research [23]. Economic status also significantly influenced depression, with poorer individuals reporting a higher prevalence, consistent with other studies [14,23,27]. The analysis shows a higher prevalence of depression among those who were not physically active. Similarly, findings are reported in the literature [28–30]. As the scope of this study is the analysis of the association of depression with disease and disability status, all these significant factors discussed above were controlled in adjusted models.

Depression is a major risk factor for suicide, and in this study, we observed 49.4% of the respondents with suicidal ideation, of which 8.5% had attempted suicide [31]. This is significantly higher than reported in a study by Nosek et al., which showed a 20% prevalence of suicidal ideation [32]. The difference may be attributed by the factor that the study was conducted only among females in a different socio-cultural setting.

Individuals with comorbidities had significantly higher odds of depression which is consistent with findings from another study in Pakistan [33]. The association of comorbidity and depression was significant at a 0.05 level of significance after adjusting for individual-level factors. This suggests that comorbidity is a strong predictor of depression; the presence of pre-diagnosed diseases other than disabilities also influences the mental health status of the individual with disabilities. However, the association was not significant at the same significance level when adjusted for both individual and family/community level factors. This suggests potential interaction in the association of comorbidity and depression by family/community level factors, which was not assessed in this study and should be explored further in future research.

Treatment accessibility was found to be significantly associated with depression in an unadjusted model as well as the adjusted Model 2 (adjusted for individual-level factors) and Model 3 (adjusted for family/community-level factors), which is consistent with findings from Shen et al. 2017 [23].

This study shows poor mental health among those who are deprived of health services. Access to medical care is likely to be affected by the economic and social conditions of the respondent. The study reported about 59% of respondents without access to care, which is a concern that needs serious attention.

Though higher odds of depression were seen among people with physical disabilities, no significant association between the type of disability and depression was observed. A statistically significant association between the level of disability and depression was observed in both unadjusted and adjusted analyses, which indicates that the severity of the disability is a crucial factor influencing depression. Those with very severe disabilities were the most vulnerable ones and had higher odds of depression than those with mild disabilities. This might be because individuals with mild levels of disabilities have better physical performance and fewer activity limitations than those with severe or very severe levels of disabilities. Similar to this result, several studies also showed that the overall odds of depression were markedly lower in people with better physical performance or less functional disability [27,34].

Disabilities acquired later in life had higher odds of having depression than those with disabilities from birth. The association of time of disabilities and depression was statistically significant in unadjusted analysis. However, this association was statistically insignificant after adjusting for sociodemographic factors (individual-level, family/community-level, or both). This suggests some

influence of sociodemographic factors in the crude association between the timing of disability and depression.

This study assessed the under-explored and stigmatized matter of depression among people with disabilities. To the best of our knowledge, this type of community-based study focusing on the mental health of individuals with different disability types is limited in the context of Nepal. The majority of the studies are conducted in an institutional setting and focus on a single type of disability. This community-based study includes people with multiple disability types. The study is limited to one rural municipality of Nepal and only includes the people with disabilities listed on the municipality disability list and does not consider people not in the listed records. Another major limitation of the study is that it has no comparison group, as it was focused more on assessing the magnitude of the problem among people with disabilities rather than comparison with the general population. A large-scale study on the mental health of people with disabilities is recommended to grab a globally representative scenario.

CONCLUSION

The study showed that out of 164 people with disabilities in Ilam municipality, 39% of the respondents had depression, and about one-third of participants were in borderline depression. In an analysis of the association between disability, disease status, and depression after adjusting for various levels of sociodemographic factors, the level of disability was a significant factor contributing to depression. Likewise, based on different models, having preexisting disease conditions other than disability and service accessibility (treatment status) for the existing conditions were found to have significant associations with depression among individuals with disabilities. Findings from the study revealed that both the individual and family/community-level

factors together have strong influence in depression among individuals with disabilities. Therefore, these factors should be considered in planning and strategy development to improve health, enhance well-being, and prevent depression among people with disabilities.

### **Ethical approval**

Ethical approval was obtained from the institutional review committee of Manmohan Memorial Institute of Health Sciences, Kathmandu, Nepal; MMIHS IRC 320. Informed written consent was taken from each participant after explaining the objective of the study.

### **Data availability statement**

Additional data can be provided upon request to the corresponding author.

### **Funding**

This study has not been financially supported by any organization.

### **Competing interests**

The authors declare that there is no conflict of interest regarding the publication of this paper.

### **Contributors**

Conceptualization: Apekshya Ghimire, Durga K. Mishra; Methodology: Apekshya Ghimire; Formal analysis and investigation: Apekshya Ghimire; Writing - original draft preparation: Apekshya Ghimire; Writing - review and editing: Apekshya Ghimire, Durga K. Mishra; Resources: Apekshya Ghimire, Durga K. Mishra; Supervision: Durga K. Mishra. Durga K. Mishra Apekshya Ghimire is the guarantor for the study.

**Acknowledgements**

We want to acknowledge the reviewers and editors for all the constructive and insightful comments on the manuscript. We heartily appreciate Mr. Albert Dahal for his help in review editing the manuscript. We would like to heartily thank all the participants of this study, the faculty members of the Department of Public Health, Manmohan Memorial Institute of Health Sciences, Ilam municipality, and Karuna Foundation Nepal for their support.

**References**

1. World Health Organization. International classification of impairments, disabilities, and handicaps : a manual of classification relating to the consequences of disease, published in accordance with resolution WHA29.35 of the Twenty-ninth World Health Assembly, May 1976 [Internet]. World Health Organization; 1980 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/41003>
2. World Health Organization. WHO fact sheet on disability and health. 2023 [cited 2024 Oct 10]. Disability. Available from: <https://www.who.int/news-room/fact-sheets/detail/disability-and-health>
3. World Health Organization. WHO global disability action plan 2014-2021: better health for all people with disability [Internet]. World Health Organization; 2015 [cited 2021 Jun 14]. Available from: <https://apps.who.int/iris/handle/10665/199544>
4. Mushtaq S, Akhouri D. Self esteem, anxiety, depression and stress among physically disabled people. International Journal of Indian Psychology [Internet]. 2016;3(4):64. Available from: [https://ijip.in/wp-content/uploads/ArticlesPDF/article\\_81b80042dfbc4de8801d60566dc08ba5.pdf](https://ijip.in/wp-content/uploads/ArticlesPDF/article_81b80042dfbc4de8801d60566dc08ba5.pdf)
5. WHO EMRO | Depression: Let’s talk | World Health Day 2017 | World Health Days [Internet]. [cited 2021 Jun 14]. Available from: <http://www.emro.who.int/world-health-days/world-health-day-2017/depression-lets-talk.html>
6. Organization WH. Depression and other common mental disorders: global health estimates. 2017 [cited 2021 Jun 14]; Available from: <https://apps.who.int/iris/handle/10665/254610>
7. Noh JW, Kwon YD, Park J, Oh IH, Kim J. Relationship between Physical Disability and Depression by Gender: A Panel Regression Model. PLOS ONE [Internet]. 2016 Nov 30



- [cited 2021 Jun 14];11(11):e0166238. Available from: <https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0166238>
8. Hollon SD, Cohen ZD, Singla DR, Andrews PW. Recent Developments in the Treatment of Depression. *Behav Ther.* 2019 Mar;50(2):257–69.
  9. Bradley SM, Rumsfeld JS. Depression and cardiovascular disease. *Trends Cardiovasc Med.* 2015 Oct;25(7):614–22.
  10. Krittanawong C, Maitra NS, Qadeer YK, Wang Z, Fogg S, Storch EA, et al. Association of Depression and Cardiovascular Disease. *The American Journal of Medicine* [Internet]. 2023 Sep 1 [cited 2025 Jan 13];136(9):881–95. Available from: [https://www.amjmed.com/article/S0002-9343\(23\)00334-0/fulltext](https://www.amjmed.com/article/S0002-9343(23)00334-0/fulltext)
  11. Yokoya S, Maeno T, Sakamoto N, Goto R, Maeno T. A Brief Survey of Public Knowledge and Stigma Towards Depression. *J Clin Med Res* [Internet]. 2018 Mar [cited 2021 Jun 14];10(3):202–9. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5798266/>
  12. Hussain N, Sikander M, Maqsood M. Level of Depression in Physically Disabled. 2014;5.
  13. Aneshensel CS, Frerichs RR, Huba GJ. Depression and Physical Illness: A Multiwave, Nonrecursive Causal Model. *Journal of Health and Social Behavior* [Internet]. 1984 [cited 2021 Sep 2];25(4):350–71. Available from: <https://www.jstor.org/stable/2136376>
  14. Jones KH, Jones PA, Middleton RM, Ford DV, Tuite-Dalton K, Lockhart-Jones H, et al. Physical Disability, Anxiety and Depression in People with MS: An Internet-Based Survey via the UK MS Register. *PLoS One* [Internet]. 2014 Aug 25 [cited 2021 Sep 3];9(8):e104604. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4143231/>
  15. Zhou L, Wang W, Ma X. The bidirectional association between the disability in activities of daily living and depression: a longitudinal study in Chinese middle-aged and older adults. *BMC Public Health* [Internet]. 2024 Jul 15 [cited 2024 Oct 10];24(1):1884. Available from: <https://doi.org/10.1186/s12889-024-19421-w>
  16. Jiang C hong, Zhu F, Qin T ting. Relationships between Chronic Diseases and Depression among Middle-aged and Elderly People in China: A Prospective Study from CHARLS. *CURR MED SCI* [Internet]. 2020 Oct 1 [cited 2024 Oct 10];40(5):858–70. Available from: <https://doi.org/10.1007/s11596-020-2270-5>
  17. Risal A, Manandhar K, Linde M, Koju R, Steiner TJ, Holen A. Reliability and Validity of a Nepali-language Version of the Hospital Anxiety and Depression Scale (HADS). *Kathmandu Univ Med J (KUMJ).* 2015 Jun;13(50):115–24.
  18. Bjelland I, Dahl AA, Haug TT, Neckelmann D. The validity of the Hospital Anxiety and Depression Scale. An updated literature review. *J Psychosom Res.* 2002 Feb;52(2):69–77.

19. Jha DAK, Ojha DSP. National Mental Health Survey Team. Nepal Health Research Council [Internet]. 2020; Available from: <https://nhrc.gov.np/wp-content/uploads/2022/10/National-Mental-Health-Survey-Report2020.pdf>

20. Karki P, Shahi PV, Sapkota KP, Bhandari R, Adhikari N, Shrestha B. Depressive symptoms and associated factors among persons with physical disabilities in disability care homes of Kathmandu district, Nepal: A mixed method study. PLOS Global Public Health [Internet]. 2023 Jan 12 [cited 2024 Oct 12];3(1):e0001461. Available from: <https://journals.plos.org/globalpublichealth/article?id=10.1371/journal.pgph.0001461>

21. Al-Abbudi S, Ezzat K, Zebala A, Hamdy D, Beedany M, Farhan M. Prevalence and Determinants of Depression Among Traumatic Spinal Cord Injured Patients Attending Ibn-Al-Quff Hospital, Baghdad, Iraq. Journal of Psychiatry. 2017 Jan 1;20.

22. Zaidi SM. COMORBIDITY OF PHYSICAL DISABILITY WITH DEPRESSION AND ANXIETY. International Journal of Environment, Ecology, Family and Urban Studies (IJEEFUS). 2013 Mar 30;3:79–86.

23. Shen SC, Huang KH, Kung PT, Chiu LT, Tsai WC. Incidence, risk, and associated factors of depression in adults with physical and sensory disabilities: A nationwide population-based study. PLoS One [Internet]. 2017 Mar 31 [cited 2021 Sep 2];12(3):e0175141. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5376337/>

24. Montesó-Curto P, Aguilar C, Lejeune M, Casadó-Marin L, Casanova Garrigós G, Ferré-Grau C. Violence and depression in a community sample. J Clin Nurs. 2017 Aug;26(15–16):2392–8.

25. Olofsson N, Lindqvist K, Danielsson I. Higher risk of violence exposure in men and women with physical or sensory disabilities: results from a public health survey. J Interpers Violence. 2015 Jun;30(10):1671–86.

26. Hughes K, Bellis MA, Jones L, Wood S, Bates G, Eckley L, et al. Prevalence and risk of violence against adults with disabilities: a systematic review and meta-analysis of observational studies. Lancet. 2012 Apr 28;379(9826):1621–9.

27. Gale CR, Sayer AA, Cooper C, Dennison EM, Starr JM, Whalley LJ, et al. Factors associated with symptoms of anxiety and depression in five cohorts of community-based older people: the HALCYon (Healthy Ageing across the Life Course) Programme. Psychol Med. 2011 Oct;41(10):2057–73.

28. Okoro CA, Strine TW, Balluz LS, Crews JE, Mokdad AH. Prevalence and correlates of depressive symptoms among United States adults with disabilities using assistive technology. Prev Med. 2010 Apr;50(4):204–9.



29. Rask S, Castaneda AE, Koponen P, Sainio P, Stenholm S, Suvisaari J, et al. The association between mental health symptoms and mobility limitation among Russian, Somali and Kurdish migrants: a population based study. *BMC Public Health*. 2015 Mar 20;15:275.
30. De Mello MT, Lemos V de A, Antunes HKM, Bittencourt L, Santos-Silva R, Tufik S. Relationship between physical activity and depression and anxiety symptoms: a population study. *J Affect Disord*. 2013 Jul;149(1–3):241–6.
31. Choi SB, Lee W, Yoon JH, Won JU, Kim DW. Risk factors of suicide attempt among people with suicidal ideation in South Korea: a cross-sectional study. *BMC Public Health* [Internet]. 2017 Dec [cited 2021 Sep 3];17(1):579. Available from: <http://bmcpublichealth.biomedcentral.com/articles/10.1186/s12889-017-4491-5>
32. Nosek MA, Hughes RB, Robinson-Whelen S. The complex array of antecedents of depression in women with physical disabilities: implications for clinicians. *Disabil Rehabil*. 2008;30(3):174–83.
33. Maqsood F, Flatt JD, Albert SM, Maqsood S, Nizamuddin M. Correlates of Self-Reported Depressive Symptoms: A Study of Older Persons of Punjab, Pakistan. *J Cross Cult Gerontol* [Internet]. 2013 Mar [cited 2025 Jan 19];28(1):65–74. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3580032/>
34. Asdaq SMB, Alshehri S, Alajlan SA, Almutiri AA, Alanazi AKR. Depression in persons with disabilities: a scoping review. *Front Public Health* [Internet]. 2024 May 7 [cited 2025 Jan 19];12. Available from: <https://www.frontiersin.org/journals/public-health/articles/10.3389/fpubh.2024.1383078/full>

**Supplementary Table S1.** Distribution of participant’s socio-demographic characteristics

Variables	Frequency	Percentage
<b>Age (n= 164)</b>		
Mean ± SD	38.37 ± 15.75	
Range	18-65	
18-35	82	50
36-55	50	30.5
56-65	32	19.5
<b>Sex (n= 164)</b>		
Male	95	57.9
Female	69	42.1
<b>Marital status (n= 164)</b>		
Unmarried	91	55.5
Married	73	44.5
<b>Family type (n= 164)</b>		
Nuclear	68	41.5
Joint	96	58.5
<b>Education status (n= 164)</b>		
Illiterate	52	31.7
Literate	37	22.6
Formal education	75	45.7
<b>Employment (n= 164)</b>		

Unemployed	63	38.4
Employed	29	17.7
Housemakers	26	15.8
Students	19	11.6
Agriculture	27	16.5
<b>Economic status (n= 164)</b>		
Below poverty	84	51.2
Above poverty	80	48.7
<b>Experience of violence (n= 164)</b>		
Yes	109	66.5
No	55	33.5
<b>Types of violence (n = 109)*</b>		
Physical	20	21.1
Sexual	6	6.3
Mental	89	93.7
Emotional	94	98.9
Deprivation	54	20.5
<b>Involvement in social function (n= 164)</b>		
Almost every function	26	15.9
Sometimes	72	43.9

Never	66	40.2
<b>Assistive device</b> (n= 164)		
Yes	62	37.8
No	102	62.2
<b>Physical activity</b> (n= 164)		
Never	63	38.4
Sometimes	47	28.7
Regular	54	32.9
<b>Substance abuse</b> (n= 164)		
Yes	47	28.7
No	117	71.3
<b>Types of substance abuse*</b> (n=47)		
Alcohol	19	40.4
Smoking	46	97.9
Other	2	4.2

\*=multiple responses recorded where participants provided more than one categories of response.

**Supplementary Table S2.** Association of participant's characteristics with depression

Variables	Depression (%)	No Depression (%)	P-value
<b>Age (n= 164)</b>			
18-35	23 (28%)	59 (72%)	0.001
36-55	19 (38.8%)	30 (61.2%)	
56-65	22 (66.7%)	11 (33.3%)	
<b>Sex (n= 164)</b>			
Male	29 (30.5%)	66 (69.5%)	0.009
Female	35 (50.7%)	34 (49.3%)	
<b>Marital status (n= 164)</b>			
Married	35 (47.9%)	38 (52.1%)	0.36
Unmarried	29 (31.9%)	62 (68.1%)	
<b>Family type (n= 164)</b>			
Nuclear	27 (39.7%)	41 (60.3%)	0.88
Joint	37 (38.5%)	59 (61.5%)	
<b>Education status (n= 164)</b>			
Illiterate	33 (63.5%)	19 (36.5%)	<0.001
Literate	17 (45.9%)	20 (54.1%)	
Formal education	14 (18.7%)	61 (81.3%)	
<b>Employment (n= 164)</b>			
Unemployed	32 (50.8%)	31 (49.2%)	< 0.001

Employed	7 (24.1%)	22 (75.9%)	
Housemakers	17 (65.4%)	9 (34.6%)	
Students	2 (10.5%)	17 (89.5%)	
Agriculture	6 (22.2%)	21 (77.8%)	
<b>Economic status (n= 164)</b>			
Below poverty	50 (59.5%)	34 (40.5%)	< 0.001
Above poverty	14 (17.5%)	66 (82.5%)	
<b>Experience of violence (n= 164)</b>			
Yes	52 (47.7%)	57 (52.3%)	0.001
No	12 (21.8%)	43 (78.2%)	
<b>Involvement in social function (n= 164)</b>			
Almost every function	3 (11.5%)	23 (88.5%)	<0.001
Sometimes	22 (30.6%)	50 (69.4%)	
Never	39 (59.1%)	27 (40.9%)	
<b>Assistive device (n= 164)</b>			
Yes	24 (38.7%)	38 (61.3%)	0.949
No	40 (39.2%)	62 (60.8%)	
<b>Physical activity (n= 164)</b>			
Never	35 (55.6%)	28 (44.4%)	0.001
Sometimes	17 (36.2%)	30 (63.8%)	
Regular	12 (22.2%)	42 (77.8%)	

**Substance abuse** (n= 164)

Yes	23 (48.9%)	24 (51.1%)	0.099
No	41 (35%)	76 (65%)	

For peer review only