Prevalence of and factors associated with health literacy among people with Noncommunicable diseases (NCDs) in South Asian countries: A systematic review

Bhushan Khatiwada, Bibika Rajbhandari, Sabuj Kanti Mistry, Shradha Parsekar, Uday Narayan Yadav

PII: S2213-3984(22)00217-2
DOI: https://doi.org/10.1016/j.cegh.2022.101174
Reference: CEGH 101174

To appear in: Clinical Epidemiology and Global Health

Received Date: 21 May 2022
Revised Date: 11 October 2022
Accepted Date: 31 October 2022

Please cite this article as: Khatiwada B, Rajbhandari B, Mistry SK, Parsekar S, Yadav UN, Prevalence of and factors associated with health literacy among people with Noncommunicable diseases (NCDs) in South Asian countries: A systematic review, Clinical Epidemiology and Global Health (2022), doi: https://doi.org/10.1016/j.cegh.2022.101174.

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Running title: Health Literacy among people with Noncommunicable diseases (NCDs)

1,2Bhushan Khatiwada, 1,2Bibika Rajbhandari, 3Sabuj Kanti Mistry, 4Shradha Parsekar, 1,2,3,5Uday Narayan Yadav

1Centre for Research Policy and Implementation (CRPIN), Biratnagar, Nepal
2Torrens University, Sydney, Australia
3Centre for Primary Health Care and Equity, UNSW, Sydney, Australia
4Department of Community Medicine, Kasturba Medical College, Manipal, Karnataka, India
5National Centre for Epidemiology and Population Health, The Australian National University, Canberra, Australia

Corresponding author: Uday Narayan Yadav, National Centre for Epidemiology and Population Health, The Australian National University, Canberra, Australia. E-mail: unyadav1@gmail.com, contact: +61-405846602

Total word count: 4216

The number of tables: 3

Number of figures: 1

A total number of references: 92
Abstract

Problem considered: Health literacy increases the ability of people living with non-communicable diseases (PLWNCDs) to read and understand medical information, access health information and health services, and involvement in shared decision-making required for improving health outcomes and health behaviours. This systematic review aimed to synthesize available evidence on the prevalence and associated factors of adequate and inadequate health literacy among PLWNCDs in South Asian countries.

Methods: Based on PRISMA guidelines, a systematic review of primary studies published between 2010 and 2021 was carried out using four electronic databases and search engines, namely Medline (PubMed and EBSCOhost), CINAHL, Scopus, and Google search engines with various key search terms. Data were extracted, and the findings were narratively synthesized.

Results: A total of thirteen studies were included from four countries, and most of them were from Pakistan. The review found that majority of PLWNCDs had inadequate health literacy. The prevalence of inadequate health literacy was higher among people with diabetes (26.00%-80.88%), cardiovascular disease (51.80%-83.43%), and chronic obstructive pulmonary disease (74.80%-79.00%). No studies were found assessing the level of health literacy among people with chronic kidney diseases. Various factors such as poor disease knowledge, no or less educational attainment, belonging to an indigenous or marginalised community from rural areas, and being female were found to be associated with inadequate health literacy.

Conclusion: Overall, our review found that PLWNCDs had inadequate health literacy. Therefore, it is important to design and implement interventions focusing on improving health
literacy among PLWNCDs, which can help promote healthy behaviours and improve the skills to self-manage NCDs in South Asian countries.

**Keywords:** Health Literacy, Noncommunicable Diseases, Prevalence, South Asia

1. **Introduction**

Noncommunicable diseases (NCDs) are one of the most emerging public health burdens that have posed significant global challenges to the healthcare system. Worldwide, NCDs account for 73% of total global deaths, which is about 41.1 million deaths per year. A recent study conducted by the World Health Organization (WHO) (2021) found that out of 41 million global NCD deaths, 32 million occur in low- and middle-income countries (LMICs). A study by Martinez et al. (2020) reports that 83.9% (approximately 34.5 million) of global NCD deaths could be averted through the provision of high-quality health care, addressing common risk factors such as tobacco use, harmful use of alcohol, unhealthy diet and low level of physical activity, as well as ensuring effective public health interventions and policies to address public health problems. NCDs not only result in adverse health outcomes but also poses an economic burden on the country’s health system and society. The study conducted by Global Economic Burden of Non-communicable disease in 2011 predicted that by 2030 world will experience a global financial loss of US $46.7 trillion, out of which the US $30.4 trillion losses will be because of major NCDs, namely diabetes, cardiovascular disease (CVD), chronic respiratory disease and cancer.

In the absence of a cure, it becomes hard to manage NCDs over time because it evolves with shifting severity and complicated treatment regimen. PLWNCDs may face multiple consequences such as physical disability, behavioural change, social and emotional turmoil, financial difficulties, lowered self-esteem, and depression.
Regardless of the type of NCDs, the development of a generic set of skills such as patient participation in self-management of disease has been advocated to manage and control illness and improve health outcomes.\textsuperscript{9,10} Self-management involves a range of skillset and mindset that enables patients to identify their own strengths, and challenges and to design strategies that fit their circumstances required to manage overall health.\textsuperscript{9,11} Self-management intervention programs were found to be effective among PLWNCDs in improving self-care knowledge, health behaviours, and various physiological parameters (blood pressure, haemoglobin, blood glucose), which in turn result in a significant reduction of hospitalisations, frequent Emergency (ER) visits, economic loss and improvement in quality of life.\textsuperscript{9,11,12,13}

Health Literacy (HL) is identified as one of the potential factors affecting the self-care behaviours of individuals.\textsuperscript{14} HL is a set of skills through which an individual can gain access to, understand, evaluate, and utilize health-related information in order to make health-related decisions to improve and enhance the quality of life.\textsuperscript{15} Previous studies from high-income settings documented the effectiveness of HL-sensitive self-management interventions on positive health outcomes. People with an adequate level of health literacy were found to have better healthy lifestyle practices, positive change in SNAPW (smoking, nutrition, alcohol, physical activity, and weight), good self-rated health, self-efficacy, better disease knowledge, self-management of disease, and better health outcomes.\textsuperscript{16,17,18,19,20} Limited HL among people results in adverse outcomes, such as poor management of disease conditions,\textsuperscript{21} poorer physical and mental health outcomes,\textsuperscript{22} higher hospitalisation, poorer medication adherence, increased mortality rates,\textsuperscript{23,24} limited access to health care and poorer ability to understand health-related information,\textsuperscript{25} and poor health-related quality of life.\textsuperscript{26,27} In addition, health literacy has been recognised as an important foundation that enhances the level of patient understanding and awareness of chronic diseases and hence, facilitates patient engagement in self-management.\textsuperscript{28,29,30} South Asia, home to one-quarter of the
world’s population and more than one-third (approximately 37.00%) of the world’s poor people, has been noted to have a surging prevalence of NCDs.\textsuperscript{31} The increasing burden of NCDs in the South Asian region requires increased health care services and crucial participation of people, mainly those with NCDs, in the management of the disease. The Shanghai Declaration from the WHO in 2016 endorsed the importance of HL and identified it as a key for health promotion to achieve Sustainable Development Goals (SDGs) agenda.\textsuperscript{32} This highlights the importance and need to understand the factors associated with inadequate HL, which helps design people-centred HL interventions among people with low levels of HL. Low or inadequate HL is a significant problem among PLWNCDs in LMICs, and primary studies on HL focusing PLWNCDs in South Asian Countries are evolving. To date, there is no comprehensive review that documented HL prevalence and its associated factors among PLWNCDs in South Asia. Therefore, this systematic review was conducted to summarise the prevalence of HL and its associated factors among PLWNCDs.

2. Materials and methods

This systematic review is reported in accordance with the Preferred Reporting Items for Systematic Review (PRISMA) guidelines.\textsuperscript{33} The protocol was registered in the international prospective register of systematic reviews, PROSPERO (CRD 42021230029).

2.1. Literature search strategy

A comprehensive search was done in electronic databases, namely Medline (accessed through EBSCOhost and PubMed), CINAHL, and Scopus. Additionally, Google Scholar was searched to identify potential studies. The journal articles published in English between 1\textsuperscript{st} January 2010 to 31\textsuperscript{st} December 2021 were searched by combining key search terms (both Medical Subject Headings (MeSH) and free-text keywords) using Boolean operators (“AND” & “OR”). The search terms used in this review are presented in BOX 1.
2.2. **Inclusion and exclusion criteria**

This systematic review included the studies using quantitative methods (cross-sectional studies, case-control studies, and cohort studies), which have studied HL or domains of HL using a validated tool and the factors associated with HL among PLWNCDS. PLWNCDS in this review were those who were diagnosed or living with cardiovascular diseases, chronic kidney diseases, diabetes, and chronic obstructive pulmonary disease, irrespective of other chronic co-morbidities. This review included studies conducted in South Asian settings. There was no restriction imposed on the age and gender of the participants.

We excluded systematic reviews, randomised control trials, conference papers, opinions, letters to the editors, newspaper articles, theses, and studies with only abstracts. The review also excluded the studies that measure knowledge, awareness, and studies exclusively conducted on cancer, chronic autoimmune disease, and mental illness.

2.3. **Study selection process**
The search yield was imported to Mendeley, and duplicates were removed. Subsequently, the reviewers (BK and BRB) independently screened the title and abstracts for relevance, and the eligible articles were selected for full-text screening. Thereafter, the full-text articles were retrieved and screened against the preselected inclusion and exclusion criteria. Any discrepancy between reviewers during the screening process regarding inclusion and exclusion was resolved by discussion until consensus was achieved. If consensus was not reached, another reviewer’s (UNY) opinion was sought to decide on inclusion.

2.4. Quality assessment and data extraction

The quality assessment of the included studies was performed independently by two reviewers (BK and BRB) using a critical appraisal checklist developed by Joanna Briggs Institute (JBI). Each item of the critical appraisal checklist was assigned one point with a total maximum score of eight. The total score of each study was calculated as a percentage, and the quality was assigned as good with a score of 80.00%-100%, fair with a score of 50.00%-80.00%, and poor with a score <50.00%.

Data were extracted from all the included studies into an excel spreadsheet. The information extracted from the included studies were study identifiers (authors name and article published year), country, details on NCDs, populations, settings (a place where the study was conducted), literacy tool, study design, factors, and result.

2.5. Data synthesis

Due to heterogeneity in the tools for measuring HL in the included studies, we could not perform a meta-analysis. Instead, we have conducted a narrative synthesis. Firstly, the studies were grouped in accordance with the four NCDs that addressed the prevalence of HL. The
associated factors of HL were also categorized on the basis of inadequate and adequate HL among PLWNCDs.

3. Results

The database search yielded 1618 relevant records, of which 1361 unique records were screened after duplicates were removed. The titles and abstracts were screened for relevance, and 1255 articles were removed. In the next step, a total of 18 full-text studies that fit the inclusion criteria were assessed, of which five ineligible articles were excluded, and their reasons for exclusion were documented. Following the PRISMA guidelines, the included articles are presented in Fig. 1.

3.1. Study characteristics and critical appraisal of included studies

A total of thirteen cross-sectional studies met the inclusion criteria. Of them, six were from Pakistan, four were from India, two were from Nepal, and one study was from Bangladesh. Most of the studies (n=11) were carried out in healthcare settings and two were carried out in the community settings. The sampling method was outlined in nine studies, of which five studies used the convenience sampling method, one used the simple random sampling method, one used the time-based sampling method, one used the purposive sampling method, and one used random sampling method. Six studies used face-to-face interviews, one used the telephone call method, while others administered questionnaires to patients for data collection. The studies included a broad range of sample size, ranging from 50 to 524 participants. The details of the study characteristics are presented in Table 1. The critical appraisal of included studies are presented as supplementary file.
3.2. **Health literacy measurement tools**

There was heterogeneity in measurement tools that assessed HL in the included studies (Table 2).

3.3. **Prevalence of health literacy**

The included studies in this review presented either the prevalence of adequate or inadequate HL or both. One study measured the prevalence of HL based on cut-off value, where a mean score less than the cut-off value on each domain of HL was considered as limited or low HL, while a mean score greater than the cut-off value on HL domains was considered as adequate HL. This review did not find any national-level HL studies conducted on PLWNCDs in South Asian countries. The prevalence of HL for individual NCDs has been detailed in Table 3.

3.4. **Prevalence of HL in people with diabetes**

The prevalence of HL among people living with diabetes was measured by eight studies in four countries: Nepal, Pakistan, Bangladesh, and India. The prevalence of inadequate HL among people with diabetes was higher in community settings than that in hospital settings. Prevalence of inadequate HL was 41.00% and 60.50% in Nepal and Bangladesh respectively. Variation in the prevalence of inadequate HL was observed in various geographical locations in India, with 26.00% in Delhi, 80.88% in Rajasthan, 54.00%-60.00% in Chennai, and 63.00% among various hospitals. Dissimilarity in the prevalence of inadequate HL was also observed in studies from Pakistan. A study published in 2018 found 67.20% prevalence of inadequate HL and a study among elderly females with diabetes in 2019 found 40.00% with inadequate HL (Table 3).

3.5. **Prevalence of HL among people with cardiovascular diseases**
Seven studies measured the prevalence of HL among people with CVDs. Of these studies, four were from Pakistan, one from Nepal, and two from India. Most of the studies included in this review have measured HL in health care settings and one has measured in community settings. Five studies measured HL among patients with hypertension, one study measured HL among people with ischemic heart disease, and one study measured HL among people with CVD complications. Studies conducted in various cities in Pakistan found 57.00%, 62.60%, and 70.11% people with inadequate HL in Karachi, Islamabad, and Lahore, respectively. Also, inadequate HL was found among CVDs patients from Quetta, Pakistan, on various domains of HL. The results from Nepal and India showed 51.80% and 83.43% prevalence of inadequate HL, respectively.

3.6. Prevalence of HL among people with COPD

Of all South Asian countries, HL focusing COPD was measured in studies conducted in Nepal. One of the studies was carried out in healthcare settings, while another was conducted in community-based settings. The study conducted in healthcare settings found 77.20% prevalence, while the study conducted among rural communities found more than three-quarters of the participants with inadequate HL on various domains of HL (Table 3).

One of the studies measured HL among people with both Diabetes and Hypertension and found 81.05% prevalence of inadequate HL.

3.7. Factors associated with HL

This review identified various factors associated with adequate and limited HL among PLWNCDs. The associates of HL varied according to the characteristics of participants and the nature of NCD conditions.
A study from Nepal found poor knowledge of COPD and its risk factors,\textsuperscript{36} being uneducated on HL domains, feeling understood and supported by healthcare providers (HPS), having sufficient information to manage own health (HIS), ability to find good health information (AE), understand the health information well enough to know what to do (UHI), being female on HIS, AE and UHI, low family income (\( \leq \text{USD 176 per month} \)) on domain AE, and being low ethnic group (\textit{Indigenous or Dalit}) on domain social support for health (SS)\textsuperscript{38} associated with inadequate HL.

The factors associated with adequate HL among people with diabetes were higher knowledge of diabetes,\textsuperscript{36} higher educational attainment,\textsuperscript{37, 48} skills for occupation, and having a landline phone at home, computer and internet facility at home and work.\textsuperscript{46} Similarly, factors associated with inadequate HL were lower educational attainment,\textsuperscript{37, 46} inability to interpret medication instructions,\textsuperscript{37} being female, unemployed, no landline phone at home, no computer, and internet facility at home and work,\textsuperscript{46} and poor diabetes knowledge.\textsuperscript{36}

Amongst the people with CVDs, the factors significantly associated with adequate HL were higher knowledge of CVDs,\textsuperscript{36} higher educational attainment,\textsuperscript{43, 47} patients residing in urban areas,\textsuperscript{43} and no history of re-vascularisation and medication adherence.\textsuperscript{47} Inadequate HL was associated with low educational attainment,\textsuperscript{43, 47} living in rural areas,\textsuperscript{43} with poor knowledge of CVDs,\textsuperscript{36} histories of re-vascularisation, and medication non-adherence.\textsuperscript{47}
4. Discussion

The evolving concept of HL is well recognised in improving health outcomes and quality of life among PLWNCDs. To our knowledge, this is the first review to present a comprehensive summary of the level of HL among PLWNCDs in South Asia.

Our review shows that among people with diabetes, 26.00%-80.88% had inadequate HL and 9.00%-74.00% had adequate HL in the South Asian region. Prior studies from countries such as Malaysia (85.80%)\textsuperscript{19}, Saudi Arabia\textsuperscript{50} and Ethiopia\textsuperscript{51} have reported a high prevalence of adequate HL among people with diabetes. This could be because the developing countries with better health care system provide quality care that may encourage patients to see their healthcare providers in need.\textsuperscript{52} The present review found that people with CVDs had inadequate HL (51.80%-83.43%). This finding is more than that reported in Iran\textsuperscript{53} and Thailand\textsuperscript{54} where people with CVDs had 49.00% and 48.70% inadequate HL, respectively. Intervention programs like education on disease and its risk factors, healthy diet, medication adherence by health professionals delivered through face-to-face, audiotapes mobile phone interventions (telephone calls, messages, and apps) to register fruits and vegetable consumption and handouts of health education materials were found to be effective in increasing the levels of HL\textsuperscript{55-57}. In addition, good communication with individuals, more social engagement, and physical activity seem to be helpful in maintaining HL during aging.\textsuperscript{58,59} This review found two studies that measured HL among people with COPD. Almost three-quarters of the patients with COPD had inadequate HL. This finding aligns with the study conducted in Spain, with 58.78% having inadequate HL.\textsuperscript{60} However, a study conducted in health care settings among people with COPD found a prevalence of 71.91%,\textsuperscript{61} 69.80%,\textsuperscript{62} and 67.43%\textsuperscript{63} adequate HL in different parts of the U.S.A.
This review found that various factors were determining HL among PLWNCDs. The common factors associated were educational attainment and knowledge of the disease and its risk factors. Our review found that higher educational attainment was associated with adequate HL, supported by previous studies.\textsuperscript{49, 51, 60, 64} The plausible explanation could be that people with higher educational attainment have a good cognitive level to understand and interpret the information and can take decisions to seek health services in need.\textsuperscript{65} In addition, good knowledge of disease may increase people’s confidence level, allowing them to communicate effectively and efficiently on their health issues with the health care providers.

Furthermore, our review found that lower diabetes medication knowledge was associated with inadequate HL among people with diabetes. One study conducted among people with diabetes in Ethiopia found that inadequate HL leads to difficulty reading drug labels and medication prescriptions.\textsuperscript{51} Inadequate HL decreases medication self-efficacy among people,\textsuperscript{66} which increases the percentage of low medication adherence and has an adverse health outcome in people with diabetes.\textsuperscript{67} Further, unemployment and gender disparity, being female, was also significantly associated with inadequate HL. This result is in accordance with existing literature that found an association between inadequate HL with no or low socioeconomic conditions and being women.\textsuperscript{67, 68} Additionally, our review found that having a telephone, computer and internet facility at home and work was associated with adequate HL among people with diabetes, which is consistent with published evidence.\textsuperscript{68, 69} The plausible reason could be that people often try to get health-related information through telephone consultation and the internet that might help them self-identify signs and symptoms of chronic disease early and encourage them to seek health care early.

Similarly, our review found that people residing in urban areas had a higher prevalence of adequate HL than those residing in rural areas, which is congruent with the previous study.\textsuperscript{70} People in remote or rural areas have less access to education, employment opportunity, and
healthcare facilities.\textsuperscript{71} These factors contributed to the poor HL of people.\textsuperscript{72} Another factor associated with inadequate HL was medication non-adherence, supported by a study in the U.S.A., where medication adherence was significantly lower among people with lower HL.\textsuperscript{73} People with inadequate HL tend to have low medication knowledge,\textsuperscript{74} because of which personal beliefs and actions might result in medication non-adherence. \textsuperscript{75,76}

This review found other factors associated with HL among people with COPD. Low income was associated with inadequate HL, supported by previous research in the U.S.A., where education and income levels were associated with HL.\textsuperscript{77} In addition to this, our review found that limited health literacy was associated with the female gender. A community-based study on HL found that inadequate HL on some domains of the HL tool was higher among females.\textsuperscript{78} However, prior studies from diverse communities in the USA have not found any significant association of limited HL with gender.\textsuperscript{61,62} The association of inadequate HL among female and indigenous groups in this study might be because of gender disparity and less women empowerment. Studies from rural plains of Nepal showed that women and minor ethnic groups still fail to access health and education equally because of less autonomy in decision-making. \textsuperscript{79,80} A study by Kale et al. (2015) has found the association of inadequate or lower HL with minority groups,\textsuperscript{61}, consistent with our review where minority or vulnerable groups like Dalit and indigenous people with COPD had inadequate HL.

4.1. Implication of the findings

Our study findings may aid policymakers and researchers in conducting national health literacy research. This may guide the development and implementation of a people-centred comprehensive health literacy program for PLWNCDs to improve their health outcomes. Given that health literacy is an important social determinant of health, it is crucial to develop a contextual health literacy tool that can capture individuals’ capacity to obtain, process, and
understand basic health information, skills to navigate the health care system, and ability to communicate with health care providers required to make appropriate health decisions. Moreover, the current review neither found any HL studies focusing on PLWNCDs from Afghanistan, Bhutan, Maldives, and Sri Lanka, which suggests the need for studies in these countries. Additionally, we could not find any studies that measured HL among chronic kidney disease patients in South Asian countries, which warrants future research.

4.2. Limitations

This review restricted the search to the English language and a few databases, because of which we anticipate missing some relevant articles. This review excluded information from grey literature and academic thesis. Besides these, the variation in the tools used in the studies caused a challenge for this review to pool the result statistically. Considering the above limitations, the magnitude of health literacy from our review should be cautiously interpreted as critical appraisal was not used while synthesising the findings.

5. Conclusion

The present review revealed limited HL among people with diabetes, cardiovascular and chronic obstructive pulmonary diseases in South Asia. Considering the findings from this review, we suggest the need for co-designing health promotion programs and strategies to improve HL among PLWNCDs in South Asia. Furthermore, the development of an appropriate contextual health literacy tool that can capture cultural, social and family influences on the health literacy of South Asian people.

Author’s contribution: BK conceived the idea and designed the study under the supervision of UNY. BK, BR, and UNY screened eligible articles for full-text screening BK and BR drafted
the manuscript. SKM, SP, and UNY contributed significantly to improving the quality of the manuscript. All authors read and approved the final manuscript.

**Source of funding:** The authors did not receive any funding for conducting this review.

**Declaration of competing interest:** The authors declare that no conflict of interest exists.

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Table 1: Characteristics of included studies

<table>
<thead>
<tr>
<th>Study, Year</th>
<th>Country</th>
<th>Studied NCD</th>
<th>Study population</th>
<th>Settings</th>
<th>Literacy tool</th>
<th>Study design</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shrestha et al., 2018 (37)</td>
<td>Nepal</td>
<td>Hypertension, Diabetes and COPD</td>
<td>Diabetic (n=161), hypertension (164) and COPD patients (n=101)</td>
<td>B.P. Koirala Institute of Health Science, Dharan and community hospital, Sunsari</td>
<td>pretested short version of HLS-EU-ASIA-Q</td>
<td>cross-sectional study; face to face interview</td>
<td>Inadequate health literacy</td>
</tr>
<tr>
<td>Singh et al., 2018 (38)</td>
<td>India</td>
<td>Diabetes</td>
<td>18 years above, diabetic patients (n=263)</td>
<td>Outpatient departments of tertiary care hospitals</td>
<td>REALM</td>
<td>cross-sectional study; face to face interview</td>
<td>Inadequate health literacy</td>
</tr>
<tr>
<td>Yadav et al., 2020 (39)</td>
<td>Nepal</td>
<td>COPD</td>
<td>18-70 years multi-morbid COPD population (n=238)</td>
<td>Rural Municipality of Sunsari</td>
<td>five HLQ domains out of nine HLQ domains</td>
<td>cross-sectional study; interview administered</td>
<td>Inadequate health literacy</td>
</tr>
<tr>
<td>Saleem et al., 2015 (40)</td>
<td>Pakistan</td>
<td>CVD</td>
<td>Patients with cardiovascular complication (n=163)</td>
<td>Tertiary care institute, karachi</td>
<td>Pre-validated questionnaire on HL</td>
<td>descriptive cross-sectional survey</td>
<td>Inadequate health literacy</td>
</tr>
<tr>
<td>Mehzabin et al., 2019 (41)</td>
<td>Bangladesh</td>
<td>Diabetes</td>
<td>18 years and above diabetic population (n=200)</td>
<td>Bangladesh University of Health and Science Hospital, Dhaka</td>
<td>s-TOFHLA and DKQ-10 scale</td>
<td>cross-sectional; semi-structured questionnaire</td>
<td>Inadequate health literacy</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Location</td>
<td>Condition</td>
<td>Criteria</td>
<td>Setting</td>
<td>Methodology</td>
<td>Health Literacy</td>
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<tr>
<td>Saqlain et al., 2019 (42)</td>
<td>Pakistan</td>
<td>Hypertension</td>
<td>≥65 years, diagnosed with hypertension and at least taking one medication for the previous one month (n=262)</td>
<td>Pakistan Institute of Medical Sciences, Islamabad</td>
<td>single item literacy screener (SILS) developed by Morris et al.</td>
<td>descriptive cross-sectional survey; interview administered</td>
<td>Inadequate health literacy</td>
</tr>
<tr>
<td>Saeed et al., 2018 (43)</td>
<td>Pakistan</td>
<td>Diabetes</td>
<td>&gt;30 years diabetic patients (n=204)</td>
<td>Service hospital, Mayo hospital, Sheikh Zayed hospital and Nobel hospital, Lahore</td>
<td>s-TOFHLA</td>
<td>cross-sectional study</td>
<td>Inadequate health literacy</td>
</tr>
<tr>
<td>Shahzad et al., 2018 (44)</td>
<td>Pakistan</td>
<td>Hypertension</td>
<td>≥18 years hypertensive patients using antihypertensive medications for last 6 months (n=285)</td>
<td>Sandeman Provincial Hospital, Quetta</td>
<td>Nine HLQ domains</td>
<td>Questionnaire based cross-sectional survey</td>
<td>Domains 1,2,7-9: inadequate health literacy. Domains 3-6: adequate health literacy</td>
</tr>
<tr>
<td>Hussain, Said &amp; Khan, 2020 (45)</td>
<td>Pakistan</td>
<td>Diabetes</td>
<td>&gt;60 years female with diabetes and concurrent cardiovascular disease (n=524)</td>
<td>Private hospitals, Lahore</td>
<td>Literacy assessment for Diabetes (LAD) and Diabetes Numeracy Test (DNT)</td>
<td>Cross-sectional survey; face to face interview</td>
<td>Adequate health literacy</td>
</tr>
<tr>
<td>Sahoo, Kohli &amp; Kishore, 2015 (46)</td>
<td>India</td>
<td>Diabetes and Hypertension</td>
<td>≥18 years patients with diabetes (n=50), hypertension</td>
<td>Tertiary care teaching hospital, Delhi</td>
<td>Pilot tested questionnaire for health literacy</td>
<td>Cross-sectional study;</td>
<td>Diabetes-adequate health literacy</td>
</tr>
<tr>
<td>Study</td>
<td>Country</td>
<td>Disease/Symptoms</td>
<td>Study Population</td>
<td>Data Collection Method</td>
<td>Methodological Quality</td>
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<tr>
<td>Ramasamy et al., 2016 (47)</td>
<td>India</td>
<td>Diabetes (n=100)</td>
<td>≥18 years patients with diabetes (n=50)</td>
<td>Interview administered</td>
<td>CVD-adequate health literacy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Suhail et al., 2021 (48)</td>
<td>Pakistan</td>
<td>Ischemic heart disease (n=251)</td>
<td>&gt;25 years patients with disease duration more than six months (n=100)</td>
<td>Interview administered</td>
<td>Inadequate health literacy</td>
<td></td>
<td></td>
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<tr>
<td>Gautam et al., 2021 (49)</td>
<td>India</td>
<td>Diabetes, Hypertension or both (n=417)</td>
<td>≥18 years patients with diabetes (n=136), with hypertension (n=181), diabetes and hypertension (n=95)</td>
<td>Interview administered</td>
<td>Cross-sectional; telephonically contacted</td>
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<td></td>
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<tr>
<td>Study reference</td>
<td>Inclusion criteria</td>
<td>Subjects and setting</td>
<td>Reliable/valid exposure measure</td>
<td>Measurement of condition standard</td>
<td>Identification of confounding factors</td>
<td>Confounding factors stated</td>
<td>Valid/reliable outcome measure</td>
</tr>
<tr>
<td>---------------------------------</td>
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<tr>
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<td>+</td>
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<td>Singh et al., 2018</td>
<td>+</td>
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<td>N/A</td>
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<td>Yadav et al., 2020</td>
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<tr>
<td>Saleem et al., 2015</td>
<td>+</td>
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<td>Mehzabin et al., 2018</td>
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<td>N/A</td>
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<tr>
<td>Saqlain et al., 2019</td>
<td>+</td>
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<td>N/A</td>
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<tr>
<td>Saeed et al., 2018</td>
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<td>N/A</td>
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<td>Shahzad et al., 2018</td>
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</tr>
<tr>
<td>Hussain, Said &amp; Khan, 2020</td>
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<td>N/A</td>
<td>N/A</td>
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<tr>
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<td>-</td>
<td>-</td>
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<tr>
<td>Ramasamy et al., 2016</td>
<td>+</td>
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<td>-</td>
<td>+</td>
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<tr>
<td>Suhail et al., 2021</td>
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<td>+</td>
<td>N/A</td>
<td>N/A</td>
<td>-</td>
<td>+</td>
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</tr>
<tr>
<td>Country</td>
<td>Study ID</td>
<td>Outcome assessment tool/scale</td>
<td>No. of people</td>
<td>Inadequate HL</td>
<td>Problematic/marginal HL</td>
<td>Adequate HL</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Nepal</td>
<td>Shreshta et al., 2018 (37)</td>
<td>Short version of the Europe-Asia-Health Literacy Survey Questionnaire (HLS-EU-ASIA-Q), score 0-16</td>
<td>161</td>
<td>41.00% [inadequate (0-8)]</td>
<td>19.90% [problematic (9-12)]</td>
<td>39.10% [sufficient (13-16)]</td>
<td></td>
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<tr>
<td>India</td>
<td>Sahoo, Kohli &amp; Kishore, 2015 (46)</td>
<td>Health literacy questionnaire</td>
<td>50</td>
<td>26.00% (not understanding information about blood sugar level)</td>
<td>Not Mentioned</td>
<td>74.00% (understanding information about blood sugar level), 84.00% understanding regimen of medications</td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>Singh et al., 2018 (38)</td>
<td>Rapid Estimate of Adult Literacy in Medicine (REALM), score 0-66</td>
<td>263</td>
<td>63.00% [low (0-44)]</td>
<td>28.00% [marginal (45-60)]</td>
<td>9.00% [higher (61-66)]</td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td>Saeed et al., 2018 (43)</td>
<td>Short Test of Functional Health Literacy (s-TOFHLA), score 0-36</td>
<td>204</td>
<td>67.20% [inadequate (0-16)]</td>
<td>17.60% [marginal (17-22)]</td>
<td>15.20% [adequate (23-36)]</td>
<td></td>
</tr>
<tr>
<td>Pakistan</td>
<td>Hussain, Said &amp; Khan, 2020 (45)</td>
<td>Literacy assessment for Diabetes (LAD) and Diabetes Numeracy Test (DNT)</td>
<td>524</td>
<td>40.00% [inadequate (score&lt;85%)]</td>
<td>Not Mentioned</td>
<td>57.20% [adequate (score&gt;85%)]</td>
<td></td>
</tr>
</tbody>
</table>

*Gautam et al., 2021 + satisfies criteria, - does not satisfies criteria*
<table>
<thead>
<tr>
<th>Country</th>
<th>Authors, Year</th>
<th>Instrument Description</th>
<th>Score Range</th>
<th>Mean Percentage</th>
<th>Category (Score Range)</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>Mehzabin et al., 2019 (41)</td>
<td>Short form Test of the Functional Health Literacy in Adults (s-TOFHLA), score 0-36</td>
<td>200</td>
<td>60.50%</td>
<td>[inadequate (0-16)]</td>
<td>15.50% [marginal (17-22)]</td>
</tr>
<tr>
<td>India</td>
<td>Ramasamy et al., 2016 (47)</td>
<td>Modified version of short test of functional health literacy in adults (STOFHLA) Score always-never</td>
<td>100</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>India</td>
<td>Gautam et al., 2021 (49)</td>
<td>European Health Literacy Survey Questionnaire (HLS-EU-Q47), Score 0-50</td>
<td>136</td>
<td>80.88%</td>
<td>[limited (0-33)]</td>
<td>19.11% [adequate (34-50)]</td>
</tr>
</tbody>
</table>

2. People living with cardiovascular diseases

<table>
<thead>
<tr>
<th>Country</th>
<th>Authors, Year</th>
<th>Instrument Description</th>
<th>Score Range</th>
<th>Mean Percentage</th>
<th>Category (Score Range)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nepal</td>
<td>Shreshtha et al., 2018 (37)</td>
<td>Short version of the Europe-Asia-Health Literacy Survey Questionnaire (HLS-EU-ASIA-Q), score 0-16</td>
<td>164</td>
<td>51.80%</td>
<td>[inadequate (0-8)]</td>
</tr>
<tr>
<td>India</td>
<td>Sahoo, Kohli &amp; Kishore, 2015 (46)</td>
<td>Pilot tested questionnaire for health literacy</td>
<td>50</td>
<td>Not Mentioned</td>
<td>Not Mentioned</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Saleem et al., 2015 (40)</td>
<td>Pre-validated questionnaire on HL</td>
<td>163</td>
<td>57.00%</td>
<td>[inadequate]</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Saqlain et al., 2019 (42)</td>
<td>Single item literacy screener (SILS) developed by Morris et al., score 1-5</td>
<td>262</td>
<td>62.60%</td>
<td>[inadequate]</td>
</tr>
</tbody>
</table>

76.00% understanding information about blood pressure, 60.00% understanding medication regimen.
<table>
<thead>
<tr>
<th>Country</th>
<th>Study Authors, Year</th>
<th>Survey Questionnaire</th>
<th>Score Range</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pakistan</td>
<td>Shahzad et al., 2018 (44)</td>
<td>Nine Health Literacy Questionnaire (HLQ) domains</td>
<td>285</td>
<td>Domain 1 (12±2.60, 12.50), Domain 2 (11.63±2.62, 12.50), Domain 7 (21.86±4.13, 22.50), Domain 8 (17.67±4.18, 18.50), Domain 9 (18.17±3.98, 18.50) Not Mentioned</td>
</tr>
<tr>
<td>India</td>
<td>Gautam et al., 2021 (49)</td>
<td>European Health Literacy Survey Questionnaire (HLS-EU-Q47), Score 0-50</td>
<td>181</td>
<td>83.43% [limited (0-33)] 16.57% [adequate (34-50)]</td>
</tr>
<tr>
<td>Pakistan</td>
<td>Suhail et al., 2021 (48)</td>
<td>Sixteen Item Questionnaire developed by Chew et al. score 0-64</td>
<td>251</td>
<td>70.11% [inadequate (0-34)] 29.88% [adequate (35-64)]</td>
</tr>
<tr>
<td>Nepal</td>
<td>Shreshta et al., 2018 (37)</td>
<td>Short version of the Europe-Asia Health Literacy Survey Questionnaire (HLS-EU-ASIA-Q), score 0-16</td>
<td>101</td>
<td>77.20% [inadequate (0-8)] 12.90% [problematic (9-12)] 9.90% [sufficient (13-16)]</td>
</tr>
<tr>
<td>Nepal</td>
<td>Yadav et al., 2020 (39)</td>
<td>five HLQ domains out of nine Health Literacy Questionnaire (HLQ) domains, score lower quartile-upper quartile</td>
<td>238</td>
<td>Low [HPS (79.00%), HIS (76.50%), SS (77.30%), AE (75.20%), and UHI (74.80%)] Not Mentioned</td>
</tr>
<tr>
<td>India</td>
<td>Gautam et al., 2021 (49)</td>
<td>European Health Literacy Survey Questionnaire (HLS-EU-Q47), Score 0-50</td>
<td>95</td>
<td>81.05% [limited (0-33)] 18.95% [adequate (34-50)]</td>
</tr>
</tbody>
</table>
AE: Ability to find the good health information; HIS: Having sufficient information to manage my own health; HPS: Feeling understood and supported by healthcare providers; SS: Social support for health; UHI: understand the health information well enough to know what to do.

Domain 1: Feeling Understood and Supported by Healthcare Providers

Domain 2: Having Sufficient Information to Manage My Health

Domain 3: Actively Managing My Health

Domain 4: Social Support for Health

Domain 5: Appraisal of Health Information

Domain 6: Ability to Actively Engage with Healthcare Providers

Domain 7: Navigating the Healthcare System

Domain 8: Ability to Find Good Health Information

Domain 9: Understand Health Information Well Enough to Know What to Do

Item 1: Understanding medical condition

Item 2: Understanding information from the healthcare provider

Item 3: Understanding directions on medication bottles

Item 4: Correct method of medicine intake

Item 5: Need of Help while reading instructions
Identification of new studies via databases and registers

Records identified from:
- Cinahl (n=10)
- EbscoHost (n=881)
- Scopus (n=81)
- Medline (n=209)

Identification of new studies via other methods

Records removed before screening:
Duplicate records removed (n=257)

Records screened (n=924)

Reports sought for retrieval (n=41)

Reports assessed for eligibility (n=13)

Reports excluded:
- Short review (n=1)
- Not measured health literacy (n=1)
- Not included participants with Noncommunicable diseases (n=1)

Reports not retrieved (n=0)

Records excluded (n=883)

Total studies included in review (n=13)

Fig. 1. PRISMA flow diagram.