

# Validation of Global Mental Health Assessment Tool in Western Development Region, Nepal: A Cross Sectional Study

Shankar Singh Dhami<sup>1</sup> and Laxman Datt Bhatt<sup>1\*</sup><sup>1</sup>Pokhara University, School of Health and Allied Sciences, Kaski, Nepal

Received December 12, 2019

Accepted March 09, 2020

Published April 21, 2020

\*Corresponding author: Laxman Datt Bhatt, Pokhara University, School of Health and Allied Sciences, Kaski, Nepal

e-mail: [laxmanbhattbph@gmail.com](mailto:laxmanbhattbph@gmail.com)

© 2020 School of Health Science, Mae Fah Luang University. All rights reserved.

## ABSTRACT

**Introduction:** Global Mental Health Assessment Tool Primary Care Version (GMHAT/PC) is comprehensive tool that can encompass wide array of mental health problems. This can be used by health professionals in detecting and managing mental disorders in primary care and general health settings. **Objective:** This Study aim to Validate and examine Feasibility of Global Mental Health Assessment Tool Primary Care Version in Primary Healthcare Setting of Nepal. **Methods:** We Conducted a Cross sectional study in the regional hospital of Western Development Region, Nepal. The GMHAT/PC tool and semi structured questionnaire were used to collect data. Interview was taken by the paramedical person with Proficiency Certificate Level (PCL) in General medicine qualification. Data were analyzed using SPSS-16 version. Sensitivity and specificity were calculated to measure the validity of GMHAT/PC. Positive Predictive Value (PPV) and Negative Predictive Value (NPV) of tool, positive and negative likelihood ratio were calculated. Cohen's Kappa statistics was calculated to determine inter-rater reliability for the tool. Average time taken for the interview, patient satisfaction and completion of interview by the patient was taken as an indicator of feasibility. **Results:** The tool had good sensitivity 0.79 (95% CI: 0.73-0.85) and excellent specificity 0.94 (95% CI: 0.83 – 1). Overall there was a good level of agreement between psychiatrist and GMHAT/PC tool 0.76 (95% CI: 0.67 – 0.84). Likewise, overall Positive Predictive Value (PPV) of the test was excellent 0.98 (95% CI: 0.94 – 0.99) while Negative Predictive Value (NPV) was fair 0.40 (95% CI: 0.24 – 0.56). And Likelihood Ratio Positive (LR+ve) of diagnostic agreement of the GMHAT/PC tool was 13.17 (95% CI: 2.01 – 90.67) and Likelihood Ratio Negative (LR –ve) was 0.22 (95% CI: 0.15 – 0.31). **Conclusion:** This study provides proven evidence to use Global Mental Health Assessment Tool Primary Care Version in specialist limited healthcare setting of Nepal. Findings of this study also support mid-level health workers and possibly others health workers having some training, can use the computer assisted programme GMHAT/PC to make a valid assessment and diagnosis for early detection and management of mental health related problem.

**Keywords:** Mental Health, GMHAT-PC, Primary healthcare, Nepal

## Introduction

Mental illness is considered as medical condition that lead to disrupt a person's daily normal functioning, feeling, thinking and behavior or combination of these all condition. Most mental health problems are not very severe or long lasting. However, proper support asks for help and visit doctors are important factor to early diagnosis and treatment of mental health problems. "Mental health is a state of well-being in which individuals realize their potential, can cope with the normal stresses of life, can work productively and make contributions to their community" [1].

Mental health problems are serious threats for current medical and public health sector, these are

leading causes of disability in the present world. Mental health problem alone is responsible for about 14% of global burden of disease [2]. It is estimated that about 25% of global population are affected from mental health related problems [2]. "Mental disorders make a substantial independent contribution to the burden of disease worldwide" [3].

Problem related with psychiatric disorders are common but many disorder among them are under-recognized and under-treated in the population because of few reasons such as shortage of health manpower specially psychiatrist, less concern from government, and shortage of appropriate instrument and facilities for treatment and diagnosis of mental health illnesses [4].

There are so many myths and faiths which are a barrier for the treatment of the mental disorders predominantly in the South East Asia Region of World Health Organization (WHO). Psychotic illnesses are considered a "curse from Gods" or manifestations of evil spirits or punishment for immoralities in the past life. In Nepal, there is an increasing access-gap in mental health care, especially in rural areas. Although the Government of Nepal committed to integrating mental health services into the health system through a national mental health policy in 1997, its translation into practice remains fraught with challenges. The country's 60 psychiatrists remain concentrated in urban areas, while less than ten district hospitals out of its 75 erstwhile districts offered mental health services (largely limited to psychotropic medication), and primary care providers (PCPs) have limited training and experience with mental health. Many times, patients are ignored, isolated or taken faith healers and treated with rituals rather than seeking appropriate healthcare center and proper medications in resource limited settings of Nepal [5].

Very less documented literature is available regarding validation of mental health tools in Nepal. Few mental health tools like: Beck anxiety inventory, Depression self-rating scale, Edinburgh Postpartum Depression Scale are validated in Nepal, but they are not comprehensive in nature as they can screen single mental health disorder like anxiety.

Depression, while GMHAT/PC is comprehensive tool that can encompass wide array of mental health problems [6][7][8]. Available literature shows that the tools which are validated in Nepal are not specifically for primary level setting but Primary version of GMHAT/PC is designed to use at primary level health care. The GMHAT/PC is a tool which can be used by grassroot level healthcare provider for detecting and managing mental health disorders in primary healthcare level setting and other health settings. GMHAT/PC covers detection and management of a wide range of mental health disorders, including psychosis and organic disorders. The tool is proved itself useful for early and accurate mental health problem detection and management. The tool consists of various questions on the mental state symptoms or problems. For each of the major clinical disorders, there are significant screening questions with their cutoff points which serve for shortening the interview [9]. The result from screening questions then proceeds to a summary report of symptoms, their scores and presents the GMHAT/PC diagnosis [10].

The GMHAT/PC focuses on mental illness related symptoms or problems such as; depressed mood, suicidal risk, sleep disorder, lack of appetite, eating disorders, hypochondriasis, obsessions and compulsions, disorientation, memory impairment, alcohol misuse, drug misuse, worries, anxiety and panic attacks, concentration, phobia, mania/hypomania, thought disorder, psychotic symptoms (delusions and

hallucinations), , personality disorder and stressors [11]. The tools main computer diagnosis is resulting using a ranked model and designed with International Classification of Diseases, tenth revision (ICD-10) [12][13].

The GMHAT/PC English version was developed by Dr. Sharma and Prof. Copeland, the package is an innovational itself to address mental health problem. This method object to improve the detection of mental illness in primary care and early initiation of appropriate treatments by proper skilling up of primary healthcare professionals. The tool took approximately 10 years to develop its all aspect. The Sharma and Copeland involved in epidemiological research in large population samples, funded by Wellcome Trust, the Medical Research Council UK and The Department of Health of UK [14]. We used GMHAT/PC English version to assess the feasibility of tool in resource limited primary healthcare settings of Nepal. To ensure its reliability, we translated English version questionnaire in Nepali language and back translated to English language with consultation of Psychiatrist.

### Methodology

Analytical cross-sectional study was conducted at western regional hospital of Kaski district Nepal. This hospital covers 16 districts of western region, and it provides wide range of preventive, curative and rehabilitative services. It provides psychiatric Outpatient Department (OPD) and eight bedded psychiatric indoor services. Data from the Patients visiting the Psychiatric OPD of Western Regional Hospital were collected from July 2014 to December 2014. Patient with severe psychiatric problems who did not participate in the interview were excluded for the study process.

### Data collection Tools

A semi structured questionnaire was used to assess the socio demographic information of respondents and a computer assisted GMHAT/PC version was used to assess the mental health problem of the respondent. The Global Mental Health Assessment Tool Primary Care Version has been designed to support primary healthcare professionals to make a quick and comprehensive standardized mental health assessment in primary healthcare setting [14].

### Data collection technique & process

Face to face Interview was conducted to collect the information from the patients. Census sampling was done for all the cases visiting psychiatric OPD from July 2014 to December 2014. We applied Interview in two phase, first interview was conducted by Certificate level (PCL) in General Medicine Health professional before patient being diagnosed by the psychiatrist. Then same respondent was examined by the psychiatrist for clinical diagnosis of mental disorder using ICD 10 classification. Both the interviewer and psychiatrist were blinded to each other diagnosis.

Finally, the diagnosis by Certificate Level (PCL) general Medicine Health Professional using the tool and psychiatrist diagnosis was recorded. The season for selecting these health professionals for data collection was that; these are the human resource working in primary level of health system in Nepal, hence this can also assess whether these human resources can adopt with this tool or not.

#### Data processing and Analysis

The collected data was entered and analyzed using the software SPSS version 16. Sociodemographic distribution of all participant was calculated. Sensitivity and specificity were calculated to measure its validity. Positive Predictive Value (PPV) and Negative Predictive Value (NPV) as well as Positive likelihood and negative likelihood ratio was also calculated. Cohen's Kappa statistics was calculated to determine the inter-rater reliability for the tool. Average time taken for the interview, patient satisfaction and completion of interview by the patient was taken as an indicator of feasibility.

#### Validity and Reliability

Sensitivity and specificity were calculated for the validity of the tool and Kappa statistics was calculated to assess the reliability of the tool.

#### Pre-testing of the tool

Pre-testing of the tool was done among the 10 patients in Western Regional Hospital to make the interviewer verse with the software and to identify the problems during data collection.

#### Ethical consideration

Ethical approval was obtained from Nepal Health Research Council (IRB No:182-2014). Written informed consent was taken from all the participants of the study. Information of the participants was maintained confidential and data were used only for research purpose.

#### Results

Highest age group of participants was recorded in the age group of 30-39 years and which accounts 32.1 Percent of total sample. Lowest age group was 60 years and above, which accounts 6.7% of the total participants. Age of the participants varies between 6 years to 68 years. Consent from immediate caretaker was granted for participants having age less than 18 years. The mean age of the participants was 38 years and age range were too wide (38+13.57; Mean+ SD). More than half (56.7%) of the participants were female and rest of them were male. Regarding the religious information of the participants, more than three fourth (85.8%) of the participants were Hindu, while least percentage (0.7%) were Muslim. Regarding the socio caste information, Majority were brahmin (32.8%) followed by (31.3%) Janajati caste, 18.7 % Dalit, 16.4%

Chhetri and minority were terai caste which were 0.7% of total respondents.

**Table 1** Distribution of participants according to age, sex, religion and caste (n=134)

| Variables          | N (%)       |
|--------------------|-------------|
| <b>Age</b>         | 37.54±13.57 |
| 0-9 years          | 12 (9)      |
| 20-29 years        | 23 (17.2)   |
| 30-39 years        | 43 (32.1)   |
| 40-49 years        | 26 (19.4)   |
| 50-59 years        | 21(15.7)    |
| 60 and above years | 9 (6.7)     |
| <b>Sex</b>         |             |
| Male               | 58 (43.3)   |
| Female             | 76 (56.7)   |
| <b>Religion</b>    |             |
| Hindu              | 115 (85.5)  |
| Muslim             | 1 (0.7)     |
| Christian          | 5 (3.7)     |
| Buddhist           | 13 (9.7)    |
| <b>Caste</b>       |             |
| Brahmin            | 44 (32.8)   |
| Chhetri            | 22 (16.4)   |
| Dalit              | 25 (18.7)   |
| Janajati           | 42 (31.3)   |
| Terai              | 1 (0.7)     |

Table 2 reveals that, among total participants about one third (32.85%) of participants had non-formal education, similarly 18.75% of participants were illiterate. Only 12.7% of the participants had higher education. Most of the participants (67.2%) were from rural area and 32.8% were from urban areas.

**Table 2** Distribution of participants according to education and place of residence (n=134)

| Variables                 | N (%)     |
|---------------------------|-----------|
| <b>Education</b>          |           |
| Illiterate                | 25 (18.7) |
| Non-formal                | 44 (32.8) |
| Primary                   | 14 (10.4) |
| Lower secondary           | 21 (15.7) |
| Secondary                 | 13 (9.7)  |
| Higher education          | 17 (12.7) |
| <b>Place of residence</b> |           |
| Rural                     | 90 (67.2) |
| Urban                     | 44 (32.8) |

Table 3 reveals that, 117 participants were diagnosed as having mental disorder by psychiatrist, among them 93 were correctly diagnosed by GMHAT/PC tool. 17 cases were diagnosed by psychiatrist as not having mental disorder, and among them 16 were correctly diagnosed by GMHAT/PC tool

as not having mental disorder(2). All the disorders were categorized in seven major categories according to ICD-10 classification by an independent psychiatrist. There were total 24 participants having organic disorder by psychiatrist among them 16 were correctly diagnosed by GMHAT/PC tool. Of the 5 cases of substance related disorder diagnosed by psychiatrist, 4 were correctly diagnosed by GMHAT/PC. Likewise, 5 participants were diagnosed with schizophrenia and other psychotic disorder by psychiatrist among whose 5 cases were correctly diagnosed by GMHAT/PC tool. Similarly, 43 cases of mood disorder diagnosed by psychiatrist, 41 were correctly diagnosed by GMHAT/PC tool. Among 38 cases of neurotic stress and somatoform disorder diagnosed by psychiatrist 26 were correctly diagnosed by GMHAT/PC tool. There was 1 case of personality disorder diagnosed by both psychiatrist and GMHAT/PC tool.

**Table 3** Cross-tabulation of the number of participants diagnosed by the psychiatrist and by the Global Mental Health Assessment Tool – Primary Care version (GMHAT/PC)

| Psychiatrist<br>Diagnosis | GMHAT/PC  |          |          |           |           |          |          |           | Total      |
|---------------------------|-----------|----------|----------|-----------|-----------|----------|----------|-----------|------------|
|                           | A         | B        | C        | D         | E         | F        | G        | H         |            |
| A                         | 16        | 0        | 0        | 3         | 0         | 0        | 0        | 5         | 24         |
| B                         | 0         | 4        | 0        | 1         | 0         | 0        | 0        | 0         | 5          |
| C                         | 0         | 0        | 5        | 0         | 0         | 0        | 0        | 0         | 5          |
| D                         | 0         | 0        | 0        | 41        | 2         | 0        | 0        | 0         | 43         |
| E                         | 1         | 0        | 1        | 3         | 26        | 0        | 0        | 7         | 38         |
| F                         | 0         | 0        | 0        | 0         | 0         | 0        | 0        | 1         | 1          |
| G                         | 0         | 0        | 0        | 0         | 0         | 0        | 1        | 0         | 1          |
| H                         | 0         | 0        | 0        | 0         | 0         | 1        | 0        | 16        | 17         |
| <b>Total</b>              | <b>17</b> | <b>4</b> | <b>6</b> | <b>48</b> | <b>28</b> | <b>1</b> | <b>1</b> | <b>29</b> | <b>134</b> |

A - Organic mental disorder      B - Substance related disorder  
C - Schizophrenia and other psychotic disorder      D - Mood disorder  
E - Neurotic, stress and somatoform disorder      F - Eating disorder  
G - Personality disorder      H - No mental illness

**Table 4** Sensitivity and specification of GMHAT/PC

| Variable                                   | Sensitivity<br>(95% CI) | Specificity<br>(95% CI) |
|--------------------------------------------|-------------------------|-------------------------|
| Overall                                    | 0.97<br>(0.73 – 0.85)   | 0.94<br>(0.83 – 1)      |
| Organic mental disorder                    | 0.66<br>(0.47 – 0.85)   | 0.98<br>(0.89 – 1)      |
| Substance related disorder                 | 0.80<br>(0.45 – 1)      | 1<br>(1 – 1)            |
| Schizophrenia and other psychotic disorder | 1<br>(1 – 1)            | 0.99<br>(0.97 – 1)      |
| Mood disorder                              | 0.95<br>(0.89 – 1)      | 0.92<br>(0.86 – 0.97)   |
| Neurotic, stress and somatoform disorder   | 0.68<br>(0.53 – 0.83)   | 0.97<br>(0.94 – 1)      |
| Personality disorder                       | 1<br>(1 – 1)            | 1<br>(1 – 1)            |

Table 4 shows the sensitivity and specificity of GMHAT/PC tool. The tool had good sensitivity 0.79 (95% CI: 0.73-0.85) and excellent specificity 0.94 (95% CI: 0.83 – 1). For organic mental disorder the sensitivity of the tool was found to be 0.66 (95% CI: 0.47 – 0.85) and specificity was 0.98 (95% CI: 0.89 – 1). For the substance related disorder, the sensitivity was 0.80 (95% CI: 0.45 – 1) and specificity was (95% CI: 1 – 1). For the mood disorder the sensitivity of the tool was found to be 0.95 (95% CI: 0.89 – 1) and

specificity was 0.92 (95% CI: 0.86 – 0.97). For another category, Neurotic, stress and somatoform disorder the sensitivity of the tool was 0.68 (95% CI: 0.53 – 0.83) and specificity was 0.97 (95% CI: 0.94 – 1). The sensitivity and specificity of personality was excellent which may be due to only one case which was correctly diagnosed by both psychiatrist and GMHAT/PC.

**Table 5** Level of agreement between psychiatrist diagnosis and GMHAT/PC tool diagnosis

| Variable                                   | Kappa (95% CI)     |
|--------------------------------------------|--------------------|
| Overall                                    | 0.76 (0.67 – 0.84) |
| Organic mental disorder                    | 0.74 (0.58 – 0.90) |
| Substance related disorder                 | 0.88 (0.66 – 1)    |
| Schizophrenia and other psychotic disorder | 0.90 (0.72 – 1)    |
| Mood disorder                              | 0.85 (0.76 – 0.94) |
| Neurotic, stress and somatoform disorder   | 0.70 (0.57 – 0.84) |
| Personality disorder                       | 1 (1 – 1)          |

Table 5 shows the level of agreement between psychiatrist diagnosis and GMHAT/PC tool. In general, there was a good level of agreement between psychiatrist and GMHAT/PC 0.76 (95% CI: 0.67 – 0.84). For the organic disorder the diagnostic agreement of kappa value was 0.74 (0.58 – 0.90). Likewise, for substance related disorder it was found to be 0.88 (95% CI: 0.66 – 1). For schizophrenia & other psychotic disorder kappa value was found to be very good 0.90 (95% CI: 0.72 – 1). The level of agreement for mood disorder was also good 0.85 (95% CI: 0.76 – 0.94). For another category Neurotic, stress and somatoform disorder the kappa value was 0.70 (95% CI: 0.57 – 0.84).

**Table 6** Positive and negative predictive values of GMHAT/PC tool

| Variable                                   | PPV<br>(95% CI)       | NPV<br>(95% CI)       |
|--------------------------------------------|-----------------------|-----------------------|
| Overall                                    | 0.98<br>(0.94 – 0.99) | 0.40<br>(0.24 – 0.56) |
| Organic mental disorder                    | 0.94<br>(0.71 – 0.99) | 0.93<br>(0.86 – 0.96) |
| Substance related disorder                 | 1<br>(0.40 – 1)       | 0.99<br>(0.95 – 0.99) |
| Schizophrenia and other psychotic disorder | 0.83<br>(0.36 – 0.97) | 1<br>(0.97 – 1)       |
| Mood disorder                              | 0.85<br>(0.72 – 0.93) | 0.97<br>(0.91 – 0.99) |
| Neurotic, stress and somatoform disorder   | 0.92<br>(0.76 – 0.98) | 0.88<br>(0.81 – 0.94) |
| Personality disorder                       | 1<br>(0.16 – 1)       | 1<br>(0.97 – 1)       |

The above table 6 shows positive and negative predictive value of GMHAT/PC tool. Overall PPV of the test was found to be excellent 0.98 (95% CI: 0.94 – 0.99) while NPV was found to be fair 0.40 (95% CI: 0.24 – 0.56). For organic mental disorder PPV was 0.94 (95% CI: 0.71 – 0.99) and NPV was 0.93 (95% CI: 0.86 – 0.96). Likewise, for substance related disorder PPV was 1 (95% CI: 0.40 – 1) and NPV was 0.93 (95% CI: 0.86 – 0.96) and both was found to be excellent. For another category, Schizophrenia and

other psychotic disorder PPV was found to be 0.83 (95% CI: 0.36 – 0.97), and NPV was 1 (95% CI: 0.97 – 1). The PPV of diagnostic agreement for mood disorder was 0.85 (95% CI: 0.72 – 0.93) and NPV was 0.97 (95% CI: 0.91 – 0.99). For another category, Neurotic, stress and somatoform disorder PPV was found to be 0.92(95% CI: 0.76 – 0.98) and NPV was 0.88 (95% CI: 0.81 – 0.94).

**Table 7** Positive and negative likelihood ratios of GMHAT/PC tool

| Variable                                   | L.R.+ve<br>(95% CI)       | L.R.-ve<br>(95% CI)   |
|--------------------------------------------|---------------------------|-----------------------|
| Overall                                    | 13.17<br>(2.01 – 90.67)   | 0.22<br>(0.15 – 0.31) |
| Organic mental disorder                    | 73.33<br>(10.21 – 526.63) | 0.35<br>(0.19 – 0.59) |
| Substance related disorder                 | -                         | 0.20<br>(0.03 – 1.15) |
| Schizophrenia and other psychotic disorder | 129<br>(18.31 – 908.87)   | 0                     |
| Mood disorder                              | 12<br>(6.06 – 25.33)      | 0.05<br>(0.01 – 0.20) |
| Neurotic, stress and somatoform disorder   | 32.84<br>(8.19 – 131.64)  | 0.32<br>(0.20 – 0.52) |
| Personality disorder                       | -                         | 0                     |

Table 7 reveals that, the overall LR +ve of diagnostic agreement of the GMHAT/PC tool was found to be 13.17 (95% CI: 2.01 – 90.67) and LR –ve was 0.22 (95% CI: 0.15 – 0.31). For organic mental disorder LR +ve was 73.33 (95% CI: 10.21 – 526.63), and LR –ve was 0.35 (95% CI: 0.19 – 0.59). Another category was substance related disorder and LR –ve for substance related disorder was 0.20 (95% CI: 0.03 – 1.15). Likewise, for Schizophrenia and other psychotic disorder LR +ve was 129 (95% CI: 18.31 – 908.87) and LR –ve was 0. For another category, mood disorder LR +ve was 12 (95% CI: 6.06 – 25.33) and LR –ve was 0.05 (95% CI: 0.01 – 0.20). And for neurotic, stress and somatoform disorder LR +ve was 32.84 (95% CI: 8.19 – 131.64) and LR –ve was 0.32 (95% CI: 0.20 – 0.52).

**Table 8** Distribution of participants according to feasibility indicators (n=134)

| Variables                      | N (%)      |
|--------------------------------|------------|
| <b>Average time taken</b>      | 16.95±2.69 |
| <b>Satisfaction</b>            |            |
| Satisfaction                   | 131 (97.8) |
| Unsatisfaction                 | 3 (2.2)    |
| <b>Understand question</b>     |            |
| Yes                            | 129 (96.3) |
| No                             | 5 (3.7)    |
| <b>Completion of interview</b> |            |
| Yes                            | 134 (100)  |

Table 8 show average time taken to deal out GMHAT/PC was 16.95 minutes with standard deviation 2.69. Minimum time taken for interview was 10 minute and maximum were 28 minutes. Among the

total 134 participants, most of all responded positive feedback regarding interview and most of them expressed satisfaction that the interview covered all aspects of their mental health using GMHAT/PC. More than ninety six percent (96.3%) of the participants understood question clearly. None of the participant declined to participate in the study. Hundred percent of the participants completed the interview.

## Discussion

In this study over all sensitivity and specificity of the tool was found to be 76% and 94% respectively. Similarly, the study conducted in Wrexham Maelor Hospital, UK, entitled Epidemiological and clinical use of GMHAT/PC in cardiac patients found that 73% sensitivity and 98% specificity [15]. Another study showed that good sensitivity 77% and excellent specificity 96%[16]. Another study found excellent sensitivity 97% which was higher than our study but specificity (94%) was similar to our study [17]. The study was conducted in North West of England and North Wales, aimed to assure validity and feasibility of Global Mental health diagnosis tool by nursing professionals, found to be 84% sensitivity and 92% specificity[10]. We found that the sensitivity and specificity of our study was consistent with other similar studies that have been carried out in various countries, this is because we have conducted our study in primary healthcare setting with diagnosis verification of Psychiatrist with PCL general medicine health professionals.

In this study we found good kappa value that is similar with other studies. In this study the overall kappa values was 76% which is also similar with the study conducted in North West of England and North Wales [10]. Another study reported 72% kappa value, which was slightly less than our study [16]. Likewise another study conducted in United Arab found 0.91% level of agreement[17].

Another similar study found 76% kappa value which was similar to the our study [15]. The overall positive predictive value (PPV) was 98% and negative predictive value (NPV) was 40%, similarly positive predictive value for Schizophrenia and other psychotic disorder was found to be very good i.e. 83% and negative predictive value was found to be excellent i.e. 100%. For another category mood disorder, positive and negative predictive value was found as 85% and 97% respectively. In this study we found that positive likelihood ratio was 13.7 and negative likelihood ratio was 0.22.

In our study the average time taken to complete interview was 16.95 minutes with standard deviation 2.69. And minimum time taken to complete interview was 10 minutes and maximum time was 28 minutes. Similar study was conducted in three different psychiatric day hospital of UK, which aimed to ensure validation and feasibility of the Primary Care Version of Global Mental Health Assessment Tool in older

adults and result revealed that the mean time taken to administer GMHAT/PC was 14 min with standard deviation 6.38[18][16]. Another study conducted in Jaipur, India, found that the mean time taken for the interview was around 16 minutes [14].

In this study most of the participants expressed their gratification on researcher's questionnaire pattern and coverage of all aspect and dimensions of mental health and participant friendly questionnaire pattern. and express friendly. All participants (100% of sample size) completed their interview, which is similar as the study conducted in Jaipur, India [14]. Another study conducted in three different psychiatric day hospital of UK, which aimed to ensure validation and feasibility of the Primary Care Version of Global Mental Health Assessment Tool in older adults also revealed the similar finding i.e. No participants declined and responded any negative feedback regarding the tool and questionnaire pattern [18]. Almost all participants expressed their satisfaction on researchers coverage of all aspects and dimensions of mental health using Global Mental Health Assessment Tool Primary Care Version (GMHAT/PC) [16].

#### Strength and limitation of the study

The Study had good sample size and varying degree of psychopathology in different healthcare settings. All the Clinical diagnosis were made by well-trained consultant psychiatrists using ICD-10 criteria to compare with the GMHAT/PC diagnosis. Both consultant psychiatrist and health worker doing the assessment in this study were blind to each other's diagnoses. The interviewers were not provided knowledge of the patients before the assessment. We used Consultant Psychiatrists' diagnoses as a gold standard rather than a criterion standard. Although this is fewer desirable, in routine clinical care, the diagnosis by a consultant psychiatrist is considered as an adequate gold standard. We did not attempt to examine the inter-rater reliability between the health worker who implemented the GMHAT/PC. The relatively small number of subjects in this study limited from carrying out sub-group analysis. There is no comparative group without detection of mental illness. The absence of follow up and outcomes did not allow proving changes in clinical management and outcomes.

#### Conclusion

This study provides proven evidence to use Global Mental Health Assessment Tool-Primary Care Version (GMHAT/PC) in specialist limited healthcare setting of Nepal. Findings of this study also support mid-level health workers and possibly others health workers having some training and the tool would be can used by mid-level health workers with the computer-assisted programme GMHAT/PC to make a valid assessment and diagnosis for early detection and management of mental health related around 16.95 minutes makes it feasible in routine assessments in

primary care and general health settings. The authors accept that Medical Officer may not have enough time in their routine primary care clinics, but they can utilize other health professionals in assessing the mental health of their patients using the GMHAT/PC. In some cases, it took longer to complete the interview, mainly because the patients wanted to report their emotional problems and the mid-level health workers felt it was necessary to listen to them. Both the patients and health worker found the GMHAT/PC not only acceptable, but useful in making a quick, yet comprehensive, mental health assessment.

#### Availability of data and material

Due to privacy reason, data are not publicly available, the datasets used and analyzed during the current study are available from the corresponding author on reasonable request. Authors can provide study protocol, data and materials under the request. Please redirect the email [laxmanbhattbph@gmail.com](mailto:laxmanbhattbph@gmail.com) for data and study protocols.

#### Competing Interests

Authors declares that they have no competing interests.

#### Funding

Authors declare that there was no any funding received for conducting this study.

#### Acknowledgements

We gratefully thankful to the Public health program of Pokhara University including all the faculties. We thank all the study participants and all the helping hands who support and help us in every step of our study.

#### Author contributions

All the authors had equal contribution on this study. Task were separated to all authors according to their expertise on specific topic. Shankar Singh Dhami (SSD) generated the research topic for this study and reviewed relevant literatures. Laxman Datt Bhatt (LDB) was the designer for the study. He designed methodology and analysis plan for the study and analyzed all the outcomes of the study and he also contributed on overall writeup. SSD and Laxman both compiled and drafted the manuscript.

#### References

- [1] Copeland JR, Dewey ME, Griffiths-Jones HM: A computerized psychiatric diagnostic system and case nomenclature for elderly subjects: GMS and AGE CAT. *Psychol Med.* 1986, 16: 89-99.
- [2] Behere PB, Sharma VK, Kumar V, Shah VA. *Mental Health Training for Health Professionals: Global Mental Health Assessment* Edited by.

- [3] Prince M, Patel V, Saxena S, Maj M, Maselko J, Phillips MR, et al. No health without mental health. *Lancet*. 2007;370(9590):859–77.
- [4] Bhandari D, Pandya Y. An epidemiological study of child marriages in a rural community of Gujarat. *Indian J Community Med* [Internet]. 2015;40(4):246. Available from: <http://www.ijcm.org.in/text.asp?2015/40/4/246/164392>
- [5] Mental Health and Substance Abuse, including Alcohol in the South-East Asia Region of WHO. 2001;(July).
- [6] Kohrt BA, Jordans MJD, Tol WA, Luitel NP, Maharjan SM, Upadhaya N. Validation of cross-cultural child mental health and psychosocial research instruments: Adapting the Depression Self-Rating Scale and Child PTSD Symptom Scale in Nepal. *BMC Psychiatry* [Internet]. 2011;11(1):127. Available from: <http://www.biomedcentral.com/1471-244X/11/127>
- [7] Regmi S, Sligl W, Carter D, Grut W, Seear M. A controlled study of postpartum depression among Nepalese women: Validation of the Edinburgh Postpartum Depression Scale in Kathmandu. *Trop Med Int Heal*. 2002;7(4):378–82.
- [8] Kohrt BA, Kunz RD, Koirala NR, Sharma VD. Validation of the Nepali version of beck anxiety inventory. *J Inst Med*. 2003;1–4.
- [9] Ehlers S, Gillberg C, Wing L. A Screening Questionnaire for Asperger Syndrome and Other High-Functioning Autism Spectrum Disorders in School Age Children. 1999;29(2):129–30.
- [10] Sharma VK, Lepping P, Krishna M, Durrani S, Copeland JRM, Mottram P, et al. Mental health diagnosis by nurses using the Global Mental Health Assessment Tool: A validity and feasibility study. *Br J Gen Pract*. 2008;58(551):411–6.
- [11] Psychiatrist C, Lecturer HS. Detecting mental disorders in primary care. 2009;11–3.
- [12] Wittchen H. Critical Issues in the Evaluation of Comorbidity of Psychiatric Disorders. 1996; 168:9–16. Croudace T, Evans J, Harrison G, Sharp DJ, Wilkinson E, McCann G, et al: Impact of the ICD-10 Primary Health Care (PHC) diagnostic and management guidelines for mental disorders on detection and outcome in primary care. Cluster randomised controlled trial. *Br J Psychiatry*. 2003, 182: 20-30.
- [13] Sharma Vk, Lepping P, Krishna M, Durrani S, Copeland JRM, Mottram P, Parhee R, Quinn B, Lane S, Cummins A: Can Nurses Make Accurate Mental Health Diagnosis Using GMHAT-PC? A Validity and Feasibility Study. *Br J Gen Pract*. 2008, 58 (551): 411-6.
- [14] Bishwajit G, O’Leary DP, Ghosh S, Sanni Y, Shangfeng T, Zhanchun F. Association between depression and fruit and vegetable consumption among adults in South Asia. *BMC Psychiatry* [Internet]. 2017;17(1):1–9. Available from: <http://dx.doi.org/10.1186/s12888-017-1198-1>
- [15] Meyer IH. Minority Stress and Mental Health in Gay Men. *J Health Soc Behav* [Internet]. 1995;36(1):38. Available from: <http://www.jstor.org/stable/2137286?origin=crossref>
- [16] Egede L: Major depression in individuals with chronic medical disorders: prevalence, correlates and association with health resource utilization, lost productivity and functional disability. *General Hospital Psychiatry*. 2007, 29 (5): 409-16.
- [17] Pharmaceutical R. Key points Validation and feasibility of the Global Mental Health Assessment Tool — Primary Care Version (GMHAT / PC) in older adults. :496–9.