



# A risk score to diagnose depression in general practice

## BACKGROUND

Depression is a common mental health problem often seen in primary care. This study sought to determine the accuracy of five screening questions for diagnosing common mental disorders in a general practice clinic and to develop a risk score.

## METHODS

Three hundred and fifty patients not taking psychotropic drugs were evaluated using a combination of screening and confirmatory questions, a total symptom score, and a points system (employing multivariate statistical models) to quantify the ability of each question to detect a common mental disorder.

## RESULTS

Different screening and confirmatory strategies resulted in different sensitivities and specificities. There was good agreement between the risk estimate produced by the point system and that produced directly by the multivariate models.

## DISCUSSION

The point system developed to diagnose depression in the primary care setting is an alternative approach to currently available screening methods. It is easy to use but requires changes to the physician's approach to diagnostic certainty. The study needs to be replicated and the approach refined.

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**Depression is a common mental health problem often seen in the primary care setting. The reported prevalence is 7.3–52.5%<sup>1</sup> and yet it may go unrecognised in up to 50% of cases.<sup>2</sup> While psychiatrists argue that diagnosing and managing depression is a useful clinical strategy, other studies have shown that finding previously undetected depression did not improve prognosis<sup>3</sup> and that routinely administered case finding/screening questionnaires for depression have minimal impact on the detection, management or outcome of depression by clinicians in nonpsychiatric settings.<sup>4</sup>**

There is good evidence that screening for depression in the primary care setting improves the detection rate.<sup>5–8</sup> A number of screening tools exist for use in primary care settings, however many are too time consuming for routine use. More recently it has been found that asking 2–3 simple questions may be as effective as longer instruments.<sup>6–9</sup> However, these screening questions have a high sensitivity (97%) but lower specificity (67%) in primary care<sup>8</sup> making them less attractive.

The tendency of the commonly used 12 item General Health Questionnaire (GHQ-12) to give false positive results with poor positive predictive value questions

its usefulness as an appropriate tool for case finding in the general practice setting.<sup>10</sup> The potential value of any screening and case finding instrument must be considered in the context of current high rates of identification. In contexts where continuity of care is a central feature of general practice management, case finding instruments are most efficient when focused on patients the general practitioner has not seen in the past year.<sup>10</sup>

The complexity of the task of recognising depression and common mental disorders in primary care suggests the need to review the strategies currently being employed for their recognition. The trade off between sensitivity and specificity of instruments requires that screening and consequent confirmation use two different instruments for accurate recognition of cases with high positive and negative predictive values. We postulate that the situation can be improved by the addition of a few specific questions and a scoring system to help assess the probability of a diagnosis and then to confirm it. Such probability assessments have been employed for diagnosing other disease conditions in clinical medicine.<sup>11</sup>

## Study aim

Our study attempts to determine the sensitivity and specificity of five questions to diagnose depression and

common mental disorders in primary care. It also aimed to develop a scoring system for diagnosis.

### The setting

The Community Health and Development Hospital (CHAD), Christian Medical College, Vellore, India (a secondary hospital) has been serving Kaniyambadi Block for the past 50 years. The language spoken is Tamil. A significant proportion of the population is from the lower socioeconomic strata. Agriculture and animal husbandry are the major occupations in the region.

### The participants

Every fifth consecutive patient attending the health clinic was invited to participate in the study. Three hundred and fifty patients aged 18–65 years and not on psychotropic medication were eligible to participate. Subjects with psychosis or severe language, hearing or cognitive impairment were excluded. Informed consent was obtained from the participants. The study was approved by the Institutional Review Board, Christian Medical College, Vellore.

### Methods

Sociodemographic details were collected using a special proforma. Patients were asked five questions by the primary care physician during the period of the consultation (*Table 1*). The symptoms employed in screening were part of criteria for depression.<sup>12</sup> The first two questions assess the mandatory symptoms for depression in the International Classification of Diseases.<sup>12</sup> The other three symptoms were employed as they are considered symptoms of severe forms of depression.

Depression and common mental disorders were confirmed using the Revised Clinical Interview Schedule (CIS-R), a commonly used standardised, semistructured interview to assess common mental disorders in primary care.<sup>13,14</sup>

Screening questions and the CIS-R were initially translated by two health professionals – proficient in Tamil and English – into Tamil. The vernacular version obtained was then back translated to English by two different bilingual health professionals. The final Tamil version was arrived at by a consensus decision by all four

translators with attention being paid to content, semantic, technical and conceptual equivalence of the Tamil version.

The patients were interviewed by one of the authors (blind to the results of the previous questions) using the CIS-R. The questions and the interview were in Tamil, the local language.

Mean, standard deviation and range were employed to describe continuous variables, while frequency distributions were obtained for di/polychotomous variables. The Chi-square test was employed to assess the significance of associations for categorical data while Student's t-test was used to test the associations for continuous variables. Pearson's correlation coefficient was employed to study the correlation between continuous variables.

Sensitivity, specificity, and positive and negative predictive values were calculated for different screening questions. Screening question responses were compared with the standard CIS-R interview using the recommended threshold of 12 and above as indicating caseness. Thresholds of the screening instrument (five questions) were compared against the CIS-R and a receiver operator characteristic (ROC) curve was drawn to obtain the best threshold value for screening.

The points system<sup>11</sup> employing multivariable statistical models was used to quantify the impact of each question on the presence of common mental disorder. We estimated the regression coefficients of the multiple logistic regression model (including odds ratios and 95% confidence intervals to enhance interpretability). We organised the risk factors into categories and determined the reference value for each. We computed how far each category of each risk factor is from the base category in terms of regression units. The intercept in the logistic regression model was taken as the constant for the point system. We computed points associated with each category of risk factor. We determined the risk associated with point totals using the multiple regression equation. The statistical software SPSS for Windows Release<sup>12</sup> (SPSS Inc, 2003) was employed for the analysis of data.

### Results

All 350 eligible patients (100%) participated in the study. The majority were women (69.7%),

**Table 1. Screening questions (literal translations from Tamil)**

During the past month:

- Have you had a pervasively depressed mood or feelings of hopelessness?
- Do you get less pleasure from things that you used to enjoy?
- Have you lost weight?
- Do you have insomnia?
- Do you have suicidal ruminations?

**Table 2. Sensitivity and specificity of the screening and confirmatory questions**

	Sensitivity	Specificity
<b>Screening questions</b>		
Low mood present	81.1%	59.2%
Lack of pleasure present	63.3%	65.8%
Low mood and lack of pleasure present	56.7%	78.1%
Low mood or lack of pleasure present	87.8%	46.9%
<b>Confirmatory questions for those positive for either low mood or lack of pleasure</b>		
Weight loss present	63.3%	52.9%
Sleep disturbance present	83.5%	55.8%
Suicidal ideation present	58.2%	74.6%
Suicidal ideation and sleep disturbance present	48.1%	84.1%
Suicidal ideation, sleep disturbance and weight loss present	34.2%	90.6%

married (76.7%) and literate (73.4%). The mean age of the sample was 34.71 (SD: 12.98) years. Ninety subjects (25.7%) satisfied CIS-R criteria for common mental disorders.

### The use of the two question screen

The sensitivity and specificity of the screening questions are shown in *Table 2*. The presence of low mood alone or a positive response to either of the screening questions had a sensitivity of 81.1 and 87.8% respectively. However, the specificity of using the two questions alone was modest. A positive response to both the screening questions had a higher specificity but resulted in a conversely modest sensitivity.

### The use of the two question screen and confirmatory questions

The addition of a single confirmatory question to those who responded positively to either screening question improved the specificity to variable extents (*Table 2*). More specific results were obtained when two (sleep disturbance and suicidal ideation) or all three (suicidal ideation, sleep disturbance and weight loss) confirmatory questions were positive. The presence of three additional symptoms (sleep disturbance, suicidal ideation, weight loss) resulted in a specificity of 90.3%. However, the positive and negative predictive values were 67.5 and 70.6% respectively.

### The use of a total symptom score

The presence of all five symptoms generated a total score of five. The optimum threshold for screening using the total symptom score was three and showed a sensitivity of 83.3% and a specificity of 72.3%. The area under the ROC curve was 0.836.

### Developing and using the risk score system

A risk score to diagnose common mental disorders was developed. *Table 3* shows the estimate of the parameters of the multivariable model. We organised the risk factors significant in the model into categories. Reference values were: women 1; currently single/widow/widower 1; low mood present 1; suicidal ideation present 1; and sleep disturbance present 1. We determined how

**Table 3. Estimate of the parameters of the multivariable model\***

Risk factor	Regression coefficient	p value	Odds ratio (OR)	95% CI of OR
Intercept	-3.475	0.000		
Women	1.063	0.002	2.896	1.480–5.666
Marital status: not currently married	0.819	0.016	2.269	1.165–4.420
Low mood	0.969	0.011	2.634	1.250–5.551
Sleep disturbance	1.569	0.000	4.800	2.471–9.326
Suicidal ideation	1.170	0.000	3.221	1.690–6.138

\*Age, literacy, lack of pleasure, and weight loss were not statistically significantly associated with common mental disorder

**Table 4. Point total and estimate of risk**

Point total	Estimate of risk in %	Point total	Estimate of risk in %
0	3.01	29	34.87
1	3.31	30	37.13
2	3.64	31	39.45
3	4.00	32	41.82
4	4.39	33	44.23
5	4.82	34	46.66
6	5.29	35	49.12
7	5.81	36	51.57
8	6.37	37	54.02
9	6.98	38	56.45
10	7.65	39	58.85
11	8.37	40	61.20
12	9.15	41	63.51
13	10.00	42	65.75
14	10.92	43	67.93
15	11.92	44	70.03
16	12.99	45	72.05
17	14.14	46	73.99
18	15.37	47	75.83
19	16.70	48	77.59
20	18.11	49	79.25
21	19.61	50	80.82
22	21.21	51	82.30
23	22.89	52	83.68
24	24.67	53	84.98
25	26.54	54	86.19
26	28.50	55	87.32
27	30.55	56	88.37
28	32.67	57	89.34

far each category is from the base category in regression units: women = 1.063; currently single/widow/widower = 0.819; low mood present = 0.969; suicidal ideation present = 1.170; and sleep disturbance present = 1.569. These values were multiplied by 10 and rounded to the nearest integer to determine the points: women = 11; suicidal ideation present = 12; and so on. The absence of these factors were given scores and values of zero.

The theoretical range of the point system was 0–57. We determined the risks associated with the point total (Table 4). For example, a single woman with low mood and sleep disturbance received a score of 45, which corresponds to a 72.05% risk of having depression. Similarly, a married man with low mood, sleep disturbance and suicidal ideation receives a score of 38, which corresponds to a risk of 56.45% of being depressed. There was good agreement between risk estimates produced by the point system and that produced directly by the multivariate models.

## Discussion

Screening instruments have improved recognition rates. However, their low specificity often results in high rates of false positive cases. In addition, many instruments employed to diagnose depression are cumbersome and difficult to apply in primary care. Consequently, these instruments are often praised but seldom employed in routine clinical practice. This study attempted to evaluate a simple screening and confirmatory strategy in a busy primary care setting. The strengths of the study included: systematic sampling, the simple screening questionnaire, the objective confirmatory strategy and blind assessments. The busy setting may not have been ideal for the study but was chosen as it reflects the day-to-day reality of Indian primary care practice.

The two question screen resulted in good sensitivity but had modest specificity; following it with a three question confirmation provides good sensitivity and specificity. A positive response to either low mood or lack of pleasure had a sensitivity of 87.8%. Subjects positive for this screen for common mental disorders had a specificity of 90.6% if they

answered positively to all three confirmatory questions of sleep disturbance, suicidal ideation and weight loss. However, the modest predictive values make the strategy much less attractive when employed in routine practice.

A total score of all positive responses to the five questions was also used as a strategy to identify common mental disorders. The optimal threshold for screening using such a strategy was a score of three or more symptoms. However, the sensitivity, specificity and predictive values were also modest.

The third approach to diagnosis employed a statistical technique to calculate risk for common mental disorders. The multivariate analysis revealed that only three of the 5 symptoms and two demographic variables were significantly correlated with depression. The method also showed that each of the five risk factors had a differential weight. The point system devised showed that risk increased with an increase in score. The use of the point system would allow an accurate estimate of risk, which corresponds with the estimates when the statistical model was directly employed. The ease of the point system in diagnosing depression and common mental disorders is a major advantage.

The use of antidepressants to treat major depression is also well suited to a points system; it was developed using a threshold of caseness traditionally used by GPs to pharmacologically treat people with depression and common mental disorders. Using the points system to identify people with a high probability of having such conditions will better target treatment strategies for depression and common mental disorders.

The use of a points system to diagnose depression and common mental disorders in primary care is attractive. Nevertheless, more research needs to be done on the risk factors of depression and common mental disorders that predict a positive diagnosis. This study needs to be replicated using a more diverse panel of risk factors (especially screening questions) in order to obtain the best possible point system. It would also require a change in mindset among physicians to move from the current inaccurate present-absent dichotomy to a system that estimates risk for each patient.

Conflict of interest: none.

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