

# The Dimensions of Auditory Hallucination in Schizophrenia: Association with Depressive Symptoms and Quality of Life

Janaki V<sup>a</sup>, Suzaily W<sup>a</sup>, Abdul Hamid AR<sup>a</sup>, Hazli Z<sup>a</sup>, Azmawati MN<sup>b</sup>

<sup>a</sup>Department of Psychiatry, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latiff, Bandar Tun Razak, 56000 Kuala Lumpur, Malaysia

<sup>b</sup>Department of Community Health, Faculty of Medicine, Universiti Kebangsaan Malaysia Medical Centre, Jalan Yaacob Latiff, Bandar Tun Razak, 56000 Kuala Lumpur, Malaysia

## ABSTRACT

**Introduction:** Auditory hallucination (AH) is often unexplored in depth in clinical practice. This study sought to ascertain the relationship between AH, depressive symptoms and quality of life (QOL) and its association with socio-demographic and clinical variables. **Methods:** This was a cross sectional study done in a psychiatry unit involving 60 schizophrenic patients between 18 to 60 years old. Psychotic Symptom Rating Scale - Auditory Hallucination subscale (PSYRATS-AH), Calgary Depression Scale for Schizophrenia (CDSS) and World Health Organization Quality of Life-Brief scale (WHOQOL-BREF) were used as instruments. **Results:** Alcohol intake was found to be significantly associated with the severity of AH. A significant moderate positive correlation was found between AH total score and CDSS ( $r=0.53$ ,  $p<0.001$ ) and moderately high correlation between emotional characteristics subscale with CDSS ( $r=0.651$ ,  $p<0.005$ ). The PSYRATS-AH dimensions; amount of distress ( $r=0.721$ ,  $p<0.001$ ) and intensity of distress ( $r=0.757$ ,  $p<0.001$ ) showed significant high correlation with CDSS. As for QOL, frequency of AH ( $r=-0.419$ ,  $p<0.01$ ) and CDSS ( $r=-0.435$ ,  $p<0.01$ ) showed significant moderate negative correlation, while duration, loudness, amount and intensity of distress, disruption to life and controllability of voices had significant fair correlation with QOL. Multiple regression analysis revealed that the frequency of AH ( $p=0.047$ ), controllability of AH ( $p=0.027$ ) and depressive symptoms ( $p=0.001$ ) significantly predict QOL. **Conclusion:** Our results demonstrated that each dimension of AH had different contributions towards depressive symptoms and the QOL in patients with schizophrenia. Therefore, appropriate treatment focusing on the specific dimension of AH not only may reduce depressive symptoms, but may also improve QOL of these patients.

**KEYWORDS:** auditory hallucination, depressive symptoms, quality of life, schizophrenia

## INTRODUCTION

Schizophrenia is one of the severe psychiatric illnesses that have a median lifetime prevalence of approximately 4.0 per 1000.<sup>1</sup> The clinical presentation varies from positive to negative symptoms and cognitive impairment as well. Hallucinations were found to be the most common positive symptom in patients with schizophrenia<sup>2</sup> with auditory hallucination (AH) reported to be the commonest form<sup>3</sup> having prevalence rate about 64.3% to 83.4%.<sup>4</sup> AH tends to be frequently persistent despite remission of other psychotic symptoms. Research is still ongoing about AH to get a better understanding on the neurological process underlying schizophrenia.<sup>5</sup>

Various research had been carried out to look at the consequences of the AH on the daily living of

patients suffering from schizophrenia. A study conducted in Australia involving 199 patients with a psychotic disorder found that depression was common in patients experiencing auditory hallucination.<sup>6</sup> Another research done in New Zealand in 2010 involving 154 participants which looked into the effects of the content of the auditory hallucination on the emotional well-being found that those who heard voices with negative content were more distressed.<sup>7</sup> Likewise, similar results were obtained in a research carried out by Daalman et al in 2011 which concluded that commanding or derogative voices cause significant stress that increases the illness burden and therefore affects the quality of life (QOL) in schizophrenia patients.<sup>8</sup> Commanding AH was also reported to increase the suicidal attempt especially in schizophrenia patients who had a past history of attempting suicide.<sup>9</sup> Hence, the presence of AH especially those with negative and critical comments undoubtedly has an impact on the emotional well-being as well as the QOL in schizophrenia patients.

The available local studies focused more on examining QOL and depressive symptoms in schizophrenia patients but to our knowledge no local study had been done focusing on the

### Correspondence:

Assoc. Prof. Dr. Suzaily Wahab,  
Department of Psychiatry,  
Universiti Kebangsaan Malaysia Medical Centre,  
Jalan Yaacob Latif, Bandar Tun Razak,  
Cheras, 56000 Kuala Lumpur, Malaysia  
Tel. No: (603) 91456142  
Email: [suzailywhb@yahoo.com](mailto:suzailywhb@yahoo.com)

characteristics of AH in schizophrenia patients. A local research involving 206 patients with schizophrenia looking into their QOL found that general psychopathology and depressive symptoms had a significant association with subjective QOL.<sup>10</sup> Another Malaysian study reported that the QOL was generally poor in community based schizophrenia patients.<sup>11</sup>

So far, there had been a number of research being done that linked positive and negative symptoms of schizophrenia with QOL.<sup>12,13</sup> Available assessment tools for instance Positive and Negative Syndrome Scale (PANSS) measures a broad range of symptoms in a single dimensional scale and it is not specific to AH per se.<sup>14</sup> Haddock et al (1999) argued regarding the need of using scales that could assess the dimensions of hallucinations and delusions to further explore the psychological process behind symptom expression.<sup>15</sup> She also pointed out the importance of understanding the change in each dimension to tailor the specific treatment needs in each patient. Realizing the importance of understanding the multidimensional components of AH, our study seeks to determine the relationship between AH, depressive symptoms and QOL of schizophrenia patients and its association with socio-demographic and clinical variables.

## MATERIALS & METHODS

### *Participants and procedure*

Simple random sampling method was utilised in this cross sectional study to determine the relationship between AH, depressive symptoms and QOL in patients with schizophrenia. The study participants recruited were patients from the psychiatric unit of Universiti Kebangsaan Malaysia Medical Centre (UKMMC) whom were diagnosed with schizophrenia. The recruitment was done over a period of 6 months from December 2015 until May 2016. The inclusion criteria was patients whom fulfilled the DSM 5 criteria for schizophrenia, aged between 18 to 60 years, not severely psychotic determined by Brief Psychiatric Rating Scale (BPRS) score of  $< 52$ <sup>16</sup>, able to give written consent and those who are able to understand as well as communicate either in Malay or English.

Patients whom were not keen to participate, having other DSM 5 diagnosis, severely psychotic or mentally retarded and having comorbid substance abuse were excluded. Consent was also taken from patients' relative. The ethical committee of Pusat Perubatan Universiti Kebangsaan Malaysia (PPUKM) had granted approval for this research.

The sample size was calculated based on weak correlation of Psychotic Symptom Rating Scale, AH domain (PSYRATS-AH)<sup>17</sup> utilising G power software ( $R^2 = 0.375$ , 2 tail study, power 80%,  $\alpha 0.05$ ).

### *Instruments*

Socio-demographic questionnaire was used to gather particulars about the socio-demographic as well as clinical variables of the participants that could be related with the study outcome. These included age, sex, race, marital status, education level, employment status, age of onset of illness, duration of hearing voices, diagnosis, medication type, smoking, history of substance or alcohol intake and medical illness. Information was obtained through interview and the available medical records.

Mini International Neuropsychiatric Interview (M.I.N.I) 6.0 module K (psychotic disorder) was used for confirmation of diagnosis of schizophrenia.<sup>18</sup> It is a short structured, brief diagnostic tool for current as well as lifetime DSM-5 and ICD-10 psychiatric disorders.<sup>18</sup> The M.I.N.I has good validity and reliability and has been translated into many different languages.<sup>18</sup> The translated Malay version was used in this study.

Brief Psychiatric Rating Scale (BPRS) was utilised to assess the severity of schizophrenia symptoms. It is an interviewer administered assessment tool, consisting of 18 items.<sup>19</sup> Patients with scores above 52 are regarded as markedly ill<sup>16</sup> and therefore were excluded from the study.

The severity of AH was assessed using the Psychotic Symptom Rating Scales, auditory hallucination domain (PSYRATS-AH). PSYRATS is an interviewer-rated, 17 items, 5-point scale measuring the severity of auditory hallucination and delusion over the past one week. PSYRATS-AH consists of 11 items/dimensions "(frequency, duration, location, loudness, beliefs regarding origin of voice, amount of negative content, intensity of negative content, amount of distress, intensity of distress, disruption to life and controllability)". These items can be further grouped into physical characteristics (frequency, duration, location and loudness), emotional characteristics (amount and degree of negative content, amount and intensity of distress) and cognitive interpretation (beliefs regarding origin of voice, disruption to life and controllability).<sup>15</sup> Each item is evaluated on a point scale with a minimum score of zero (absent) to a maximum score of four (severe). Higher score indicates greater severity of symptoms. The maximum total score is 44. The validated Malay version (MyPSYRATS),<sup>20</sup> was used in this study. MyPSYRATS has been shown to have good psychometric properties with the Cronbach's alpha value of 0.86.

The presence of depressive symptoms in schizophrenia patients was assessed utilising the Calgary Depression Scale for Schizophrenia (CDSS). There were 9 items in this questionnaire; interviewer-rated on a 4-point scale with a cut-off score of  $> 6$  points indicated the presence of depressive symptoms.<sup>21</sup> CDSS was used globally in the assessment of depressive symptoms in

schizophrenia patients and it has shown to have good psychometric properties.<sup>22</sup> The translated Malay version was used in this study.

World Health Organization Quality of Life-Brief (WHOQOL-BREF) was administered to assess the overall QOL in the studied patients. WHOQOL-BREF comprised of 26 items on a 5-point scale with 4 domains namely "physical (7 items), psychological (6 items), social relationship (3 items) and environmental domain (8 items)" and 2 items on overall QOL.<sup>23</sup> Higher scores denoted a better QOL. It has been validated in the Malay language as well with satisfactory psychometric properties.<sup>24</sup> The validated Malay version was used in this study.

### Statistical analysis

Data entry as well as statistical analysis was carried out utilising Statistical Package for Social Sciences (SPSS) version 23. Descriptive analysis was done using means and standard deviation (SD) for continuous variables whereas frequencies (%) were used for categorical variables. Bivariate analysis was performed with either independent t test or one way analysis of variance (ANOVA) for the analysis of association between sociodemographic and clinical factors with AH and QOL. Depressive symptoms which was a non-normally distributed data was analysed descriptively using median and interquartile range. Pearson and Spearman correlation was used for the analysis of association between auditory hallucination, depressive symptoms and quality of life. Simple linear regression was done to determine the linear association of each independent variable to dependent variable (QOL). This was followed by multiple linear regression analysis to determine the factors that predict QOL.

## RESULTS

### Sociodemographic and clinical characteristics

A total of 60 participants who met the research criteria specified were recruited into the study within the duration of 6 months. Table I shows the sociodemographic and clinical characteristics of the respondents. The mean age was noted to be 39.68 (SD=9.40). In terms of gender, it was almost equal in number, males were 33 (55%) and females 27 (45%). Majority of the patients were Chinese, 32 (53.3%); unemployed, 46 (76.7%); single, 43 (71.7%) and with a lower educational background, 40 (66.7%).

The mean age of onset of illness was 25 (SD=7.81) years old and the mean duration of hearing voices was 14.70 (SD=9.38) years. About one third, 21 (35%) of the patients were classified as treatment resistant schizophrenia (TRS). The mean of total number of voices heard was 4.93 (SD=3.95) with predominantly second (91.7%) and third (88.3%) person AH. Besides AH, 43.3% of the patients experienced visual hallucinations as well. Majority of them were on atypical antipsychotics (66.7%). Almost two third (65%) of the patients were

smokers; majority of them (88.3%) did not have any history of substance abuse or alcohol intake and 73.7% had no comorbid medical illness.

### Clinical outcome characteristics

The overall mean score for PSYRATS-AH was 27 (SD=5.92). The physical characteristics contributed to the highest mean score of 9.82 (SD=2.38), followed by emotional characteristics which was 8.87 (SD=3.87) and cognitive interpretation 8.32 (SD=2.12) respectively. CDSS total mean score was 6.42 (SD=5.08). The percentage of patients who were found to be depressed as compared to non-depressed were equal (50%). The mean score for WHOQOL-BREF (total domains) was 62.97 (SD=11.58). The physical domain had the highest mean score of 51.13 (SD=13.86) whereas social domain had the least mean score of 41.11 (SD=16.94).

Table II shows the association between socio-demographic and clinical characteristics of the patients with severity of AH and QOL. Patients with alcohol intake as compared to patients without any history of substance or alcohol showed significant association with the severity of AH ( $p < 0.05$ ). There was no significant association between all the socio-demographic and clinical variables studied with depressive symptoms and QOL.

### Correlations between PSYRATS-AH, CDSS and WHOQOL-BREF

Table III shows the correlation between auditory hallucination score (PSYRATS-AH) with depressive symptoms (CDSS) and QOL (WHOQOL-BREF). A significant moderate positive correlation was found between AH total score and CDSS ( $r = 0.53$ ,  $p < 0.001$ ) and moderately high correlation between emotional characteristics subscale with CDSS ( $r = 0.651$ ,  $p < 0.005$ ). With regards to the correlation between the 11 items/dimensions in PSYRATS-AH with CDSS, the amount of distress ( $r = 0.721$ ,  $p < 0.001$ ) and intensity of distress ( $r = 0.757$ ,  $p < 0.001$ ) showed significant high correlation. The correlation between amount of negative content with CDSS was fair ( $r = 0.372$ ,  $p < 0.01$ ) while it was poor for duration ( $r = 0.272$ ,  $p < 0.05$ ). A significant moderate negative correlation was found between AH total score, physical characteristics subscale and depressive symptoms with QOL with  $r$  value of  $-0.496$  ( $p < 0.001$ ),  $-0.472$  ( $p < 0.001$ ) and  $-0.435$  ( $p < 0.01$ ) respectively. Cognitive interpretation subscale had fair correlation ( $r = -0.381$ ,  $p < 0.01$ ) with QOL. With respect to the association of the 11 items/dimensions of PSYRATS-AH with QOL (Table III), frequency ( $r = -0.419$ ,  $p < 0.01$ ) was found to have a significant moderate negative correlation with QOL while duration ( $r = -0.360$ ,  $p < 0.01$ ), loudness ( $r = -0.328$ ,  $p < 0.01$ ), amount of distress ( $r = -0.330$ ,  $p < 0.05$ ), intensity of distress ( $r = -0.347$ ,  $p < 0.01$ ), disruption to life ( $r = -0.363$ ,  $p < 0.01$ ) and controllability ( $r = -0.399$ ,  $p < 0.01$ ) had significant fair correlation with QOL.

**Factors predicting QOL**

As shown in Table IV, simple linear regression analysis was initially carried out to determine the possible factors that were related with QOL. History of alcohol intake, depressive symptoms (CDSS), PSYRATS-AH items/dimensions namely frequency, duration, loudness, amount and intensity of distress, disruption to life and controllability of voices were the significant factors associated with QOL. Multiple

regression analysis using the forward model was further performed to control for confounder effects and to ascertain the significant factors that predicted QOL. The significant factors of PSYRATS-AH items which predicted QOL were frequency ( $p=0.047$ ), and controllability of the voices ( $p=0.027$ ). CDSS score for depressive symptoms was also notably significant ( $p=0.001$ ) as a predictor of QOL.

**Table I** Sociodemographic and clinical characteristics of respondents (n=60)

Variables	Mean(SD)	n (%)
Age	39.68 (9.40)	
Gender		
Male		33 (55.0)
Female		27 (45.0)
Race		
Malay		22 (36.7)
Chinese		32 (53.3)
Indian		6 (10.0)
Marital status		
Single		43 (71.7)
Married		8 (13.3)
Divorced		9 (15.0)
Education Level		
Lower <sup>a</sup>		40 (66.7)
Higher <sup>b</sup>		20(33.3)
Employment status		
Employed		14 (23.3)
Unemployed		46 (76.7)
Age of onset of illness	25.00 (7.81)	
Duration of hearing voices (year)	14.70 (9.38)	
Total number of voices	4.93 (3.95)	
Form of voices		
1 <sup>st</sup> person		1 (1.7)
2 <sup>nd</sup> person		55(91.7)
3 <sup>rd</sup> person		3 (88.3)
Single word		4 (6.7)
Other forms of hallucination		
Visual		26 (43.3)
Tactile		11 (18.3)
Olfactory		7 (11.7)
Diagnosis		
Schizophrenia		39 (65.0)
Treatment resistant Schizophrenia(TRS)		21 (35.0)
Medication type (antipsychotic)		
Typical		6 (10.0)
Atypical		40 (66.7)
Combination		14 (23.3)
Smoker		
Yes		21 (35.0)
No		39 (65.0)
History of substance/alcohol intake		
Substance		2 (3.3)
Alcohol		5 (8.3)
No		53 (88.3)
Medical illness		
Yes		14 (23.3)
No		46 (76.7)

n=Number of respondents, %=Percentage, SD=Standard deviation

**Table II** Sociodemographic and clinical characteristics with severity of auditory hallucination and quality of life

Variables	Auditory hallucination			Quality of life		
	Mean (SD)	Statistical test	p-value	Mean (SD)	Statistical test	p-value
Age	39.68 (9.40)	0.009 <sup>a</sup>	0.948	39.68 (9.40)	-0.090 <sup>a</sup>	0.496
Gender						
Male	26.33 (6.01)	-0.964 <sup>b</sup>	0.339	73.85 (12.26)	-0.033 <sup>b</sup>	0.974
Female	27.81 (5.82)			73.96 (14.69)		
Race						
Malay	27.50 (6.91)	0.495 <sup>b</sup>	0.623	75.68 (13.31)	0.788 <sup>b</sup>	0.434
Non-Malay	26.71 (5.35)			72.87 (13.34)		
Marital status						
Single	26.21 (6.05)	2.197 <sup>c</sup>	0.120	74.98 (11.89)	2.546 <sup>c</sup>	0.087
Married	27.13 (4.94)			77.88 (13.76)		
Divorced	30.67 (5.17)			65.22 (16.96)		
Education Level						
Lower	27.18 (5.76)	0.321 <sup>b</sup>	0.749	71.68 (12.82)	-1.873 <sup>b</sup>	0.066
Higher	26.65 (6.38)			78.35 (13.39)		
Employment status						
Employed	26.21 (5.95)	-0.564 <sup>b</sup>	0.575	75.21 (13.22)	0.420 <sup>b</sup>	0.676
Unemployed	27.23 (5.96)			73.50 (13.24)		
Age of onset of illness	25.00 (7.18)	-0.078 <sup>a</sup>	0.555	25.00 (7.18)	-0.008 <sup>a</sup>	0.951
Duration of hearing voices (year)	14.70 (9.38)	0.070 <sup>a</sup>	0.594	14.70 (9.38)	-0.086 <sup>a</sup>	0.511
Diagnosis						
Schizophrenia	26.44 (5.75)	-1.006 <sup>b</sup>	0.319	76.18 (12.15)	1.848 <sup>b</sup>	0.070
Treatment Resistant Schizophrenia(TRS)	28.05 (6.23)			69.67 (14.54)		
Medication type						
Typical antipsychotic	23.16 (7.44)	1.441 <sup>c</sup>	0.245	77.00 (10.60)	0.281 <sup>c</sup>	0.756
Atypical antipsychotic	27.33 (5.15)			74.05 (13.85)		
Combination	27.71 (7.12)			72.14 (13.20)		
Smoker						
Yes	26.76 (6.06)	-0.227 <sup>b</sup>	0.821	70.95 (10.32)	-1.268 <sup>b</sup>	0.210
No	27.13 (5.92)			75.49 (14.51)		
History of substance/ alcohol intake						
Substance	24.00 (9.90)	3.202 <sup>c</sup>	0.048 <sup>*d</sup>	65.50 (2.12)	2.718 <sup>c</sup>	0.075
Alcohol	33.00 (5.20)			62.40 (9.02)		
No	26.55 (5.64)			75.30 (13.28)		
Medical illness						
Yes	27.50 (7.37)	0.358 <sup>b</sup>	0.721	70.36 (17.65)	-0.920 <sup>b</sup>	0.371
No	26.85 (5.49)			74.98 (11.67)		

a = Pearson correlation(r), \*p < 0.05 significant

b = t-test

c = One way ANOVA

d= post hoc test - alcohol intake vs no alcohol/substance intake differ significantly

**Table III** Correlation between auditory hallucination (PSYRATS-AH) total, subgroups and items; depressive symptoms (CDSS) and quality of life (WHOQOL-BREF)

	Depressive symptom (CDSS)		Quality of life (WHOQOL-BREF)	
	Spearman correlation, r	p-value	Pearson correlation, r	p-value
Auditory hallucination (Total)	0.530	< 0.001***	-0.496	< 0.001***
Emotional characteristics	0.651	< 0.001***	-0.261	0.044*
Cognitive interpretation	0.024	0.857	-0.381	0.003**
Physical characteristics	0.238	0.067	-0.472	< 0.001***
Depressive symptoms (total CDSS score)			-0.435	0.001**
Auditory hallucination (PSYRATS-AH) items				
Frequency	0.148	0.260	-0.419	0.001**
Duration	0.272	0.036*	-0.360	0.005**
Location	-0.096	0.464	-0.071	0.588
Loudness	0.242	0.063	-0.328	0.011*
Origin of voice	-0.187	0.152	-0.108	0.413
Amount of negative content	0.372	0.003**	-0.124	0.345
Degree of negative content	0.250	0.054	-0.040	0.763
Amount of distress	0.721	< 0.001***	-0.330	0.010*
Intensity of distress	0.757	< 0.001***	-0.347	0.007**
Disruption to life	0.348	0.006**	-0.363	0.004**
Controllability	0.060	0.649	-0.399	0.002**

\*p &lt; 0.05    \*\*p &lt; 0.01    \*\*\*p &lt; 0.001

## DISCUSSION

This cross sectional study looked into the relationship between AH, depressive symptoms and QOL in patients with schizophrenia as well as the socio-demographic and clinical variables that were associated. The mean age of onset of illness in this study was 25 years old with the patients' predominantly experiencing 2<sup>nd</sup> and 3<sup>rd</sup> person AH. The mean duration of hearing voices was found to be 15 years. Our findings were in keeping with previous studies which reported that the usual age of onset of illness is either in the late teens or early twenties.<sup>25,26</sup> In our study, socio-demographic factors such as gender, ethnicity, marital, employment and education status did not show significant association with either AH, depressive symptoms or QOL. Similar findings of no significant association were obtained in a few studies exploring the relationship between socio-demographic factors with QOL.<sup>10,27,28</sup> On the other hand, there were studies that reported employment status had a significant positive association with QOL.<sup>29</sup> whereas those unemployed had a poor QOL.<sup>30</sup> Nevertheless, a number of factors such as socio-cultural and ethnicity differences<sup>31</sup>, study design and settings as well as the assessment tools that were used to measure the outcome might have contributed to the difference in findings.

Among the clinical variables studied, history of

alcohol intake showed significant association with severity of auditory hallucination. Our findings were in keeping with previous studies which had shown significant association between positive symptoms and alcohol use.<sup>32,33</sup> In this study, one third of the patients enrolled were treatment-resistant schizophrenia (TRS). Studies have shown that the more severe the illness is, the more severe AH or positive symptoms are generally expected.<sup>34,35</sup> Surprisingly, no significant association was found in terms of severity of AH, depressive symptoms or QOL with the diagnosis of TRS or non TRS patients. These findings could possibly have been contributed by a number of variables not explored in this study, such as the compliance to antipsychotics, coping strategies towards the AH or insight about the illness, which could affect the study outcome. The anti depressant effect of clozapine could be another factor as well that might have played a part in the insignificance findings between the TRS and non TRS patients.

In this study, 50% of the patients suffered from depressive symptoms in relation to the presence of auditory hallucination. Similar findings were also reported in earlier studies exploring auditory hallucination and the relationship with depression in

**Table IV** Simple and multiple linear regression analysis of factors predicting QOL

	Crude B	p-value	QOL (WHOQOL-BREF) 95% CI	Adjusted B <sup>a</sup>	p-value	95% CI
Age	-0.13	0.496	-0.50, 0.24			
Gender (female vs male)	0.11	0.974	-6.85, 7.08			
Race (Non-Malay vs Malay)	-2.81	0.434	-9.96, 4.33			
Marital status (single/divorced vs married)	-4.59	0.368	-14.70, 5.53			
Education level (lower vs higher)	-6.68	0.066	-13.81, 0.46			
Employment status (unemployed vs employed)	-1.71	0.676	-9.89, 6.46			
Age of onset of illness	-0.01	0.951	-0.50, 0.47			
Duration of hearing voices (years)	-0.12	0.511	-0.49, 0.25			
Diagnosis (TRS vs schizophrenia)	-6.51	0.070	-13.57, 0.54			
Smoking (smoker vs non-smoker)	-4.54	0.210	-11.70, 2.63			
History of substance/alcohol intake (intake vs no intake)	-12.48	0.028*	-23.55, -1.42			
Medical illness (illness vs no illness)	-4.62	0.258	-12.72, 3.48			
Auditory hallucination (PSYRATS-AH) items						
Frequency	-5.25	0.001*	-8.24, -2.26	-3.04	0.047	-6.03, -0.05
Duration	-4.50	0.005*	-7.57, -1.43			
Location	-1.46	0.588	-6.83, 3.91			
Loudness	-5.76	0.011*	-10.13, -1.39			
Origin of voice	-1.11	0.413	-3.81, -1.59			
Amount of negative content	-1.45	0.345	-4.49, 1.60			
Degree of negative content	-0.43	0.763	-3.24, 2.39			
Amount of distress	-3.45	0.010*	-6.05, -0.86			
Intensity of distress	-3.99	0.007*	-6.83, -1.15			
Disruption to life	-7.41	0.004*	-12.41, -2.41			
Controllability	-4.89	0.002*	-7.84, -1.94	-3.28	0.027	-6.12, -0.38
Depressive symptoms (total CDSS score)	-1.14	0.001*	-1.76, -0.52	-1.00	0.001	-1.56, -0.44

a = forward model regression analysis

schizophrenia patients.<sup>26,36,37</sup> We also found a significant positive correlation between severity of AH with depressive symptoms. When the components of AH were analysed, the amount of distress and intensity of distress due to the voices heard having the strongest correlation with depression in the population studied. Our results did not support the earlier findings of Soppitt and Birchwood (1997)<sup>37</sup>, who reported that the content of the voices, especially derogatory content ( $p=0.0004$ ), intrusiveness and loudness of the voice as well as malevolent beliefs were the factors associated to the development of depression in schizophrenia patients. Amount of negative content showed significant fair correlation with depressive symptoms but degree of negative content surprisingly had no correlation in this study. This was in contrary to another study which found both amount and degree of negative content having no significant correlation with depressive symptoms.<sup>26</sup>

With regards to QOL, there was an inverse significant relationship with severity of auditory hallucination. Mainly, the physical characteristics of the voices, cognitive interpretation and to an extent the emotional characteristics (amount and intensity of distress) had significant fair negative correlation with QOL. These findings were partially in line with a study that found commanding derogatory voices imposing great distress and therefore reducing the QOL in patients with psychotic disorders.<sup>8</sup> Other studies were more focused on positive symptoms as a whole in relation to QOL rather than looking into the AH component which is multidimensional. Caron et al (2005)<sup>38</sup> found a negative association between positive symptoms severity with QOL. Likewise, in a meta-analysis conducted by Eack and Newhill (2007)<sup>39</sup> on 56 studies exploring the association between psychiatric symptoms and QOL in patients with schizophrenia, it was demonstrated that there was a significant moderate negative association between positive as well as negative symptoms with QOL, whereas the association of QOL with general psychopathology showed consistent inverse relationship in all research sample and treatment settings. Another pooled analysis also reported that patients with less psychiatric symptoms had a better QOL.<sup>40</sup> Nevertheless, few authors found that there were no significant association between positive symptoms and QOL.<sup>41,42</sup>

Depressive symptoms were found to have a significant moderate negative correlation with QOL. This finding was in fact consistent with several researches done formerly looking into the relationship between depressive symptoms and QOL.<sup>10,27</sup> Depressive symptoms also constituted one of the important and strongest factors predicting QOL in the final model of regression analysis which was supported by other studies as well.<sup>10,28,43</sup> The "distress/protection model" of QOL<sup>44</sup> shall be used to explain this finding. Based on this model, if there is a predomination of distressing factors (e.g. depressive symptoms) over protective factors (e.g.

social support, self esteem) this could result in the reduction of one or more QOL domain score. In this study, in relation to AH items, frequency and controllability of voices were found to predict QOL whereby an increase in the frequency of the AH and an increase in the uncontrollability of AH will decrease QOL score by 3 times resulting in poorer QOL. The literature pertaining to AH items as predictor of QOL are scarce. Former studies have found that positive symptoms severity in general predicted poor QOL.<sup>45,46</sup> Possible factors that could have contributed to persistent AH could partly be due to patients' belief regarding the uncontrollability of voices itself, coping mechanisms adopted as well as low self esteem. These factors gave rise to depression<sup>47</sup> which ultimately affects the QOL.

There were several limitations in this current study. The recruitment of participants from only one tertiary centre may not be representative of schizophrenia patients collectively and may impede generalization of our findings. The longitudinal relationship between the variables and outcome studied also could not be established due to the cross sectional study method. Further studies in this area may benefit from a prospective approach involving participants from randomly selected centres in the country.

## CONCLUSION

Despite its limitations, this study had highlighted the need to properly assess each of the multidimensional components of AH, as each component showed different contribution to the presence of depressive symptoms and the QOL in the patients. The frequency of the AH and the perceived controllability of the AH needs to be focused on in the general management of schizophrenic patients experiencing AH due to the strong association with QOL. The amount and intensity of distress as a result of the AH and the amount of negative content similarly need to be properly handled in patients' management for better emotional outcome. Other than pharmacological therapies to reduce positive symptoms which also include AH, the role of psychological therapies such as acceptance, commitment therapy and mindfulness<sup>48,49</sup> as well as group person-based cognitive therapy<sup>50</sup> should also be carried out with special emphasis on addressing the specific AH dimensions as mentioned.

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## CONFLICT OF INTEREST

None

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