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Disagreement Between Self-Reporting and Objective Diagnosis in Chronic Diseases Among Omanis 2008

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Abstract

Background: Health specialists and researchers usually collect information about chronic diseases from self-reports. However, the accuracy of self-reports has been questioned as it relies on the respondents' understanding of pathological conditions and their ability to recall information. Accordingly, an objective diagnosis is generally regarded as a more precise indication of the presence of disease.

Objective: The study objectives were to determine the extent of disagreement between self-reporting and objective diagnosis, identify contributory factors to the discrepancy, and examine the effects of the incongruity on quality of healthcare services and health status.

Methods: Secondary data from the most recent Oman World Health Survey (OWHS), for which data were readily available (2008), were analysed in the current study. This was the most recent survey conducted in Oman to date as collection of the data for the subsequent survey only commenced in February 2017 and is still in progress. Agreement between the self-reporting of chronic disease (diabetes mellitus and hypertension) and the results of medical examinations was calculated using kappa ($\varkappa$) statistics. Sociodemographic risk factors for the self-reported and objective measurement of disease were identified (second objective). Univariate analysis was measured initially to determine associations between the variables and the outcome. Thereafter, significant variables were included in multivariate analysis performed using logistic regression. The impact of disagreement on quality of healthcare service and health status (third objective) was also examined using the chi-square test in relation to health service quality and health status variables.

Results: Of 3524 Oman adults, aged ≥ 20 years (48% males), agreement between the self-reported and objective measurement of chronic disease was found to be poor to moderate ($\varkappa = 0.001\text{-}0.141$). The highest agreement was observed for diabetes mellitus ($\varkappa = 0.402$) and the lowest was found for asthma ($\varkappa = 0.000$). Socioeconomic or demographic characteristics were not significantly associated with the degree of agreement attained between the methods used to measure chronic disease ($p = > 0.050$), except for sex, age and region. The discrepancy did not significantly impact on familial support (i.e., financial, social, health, physical and personal), the responsiveness of the health system, and household income or expenditure. However, the disagreement was associated with significant effects for other healthcare service and health status variables, i.e., quality of life and health service utilisation ($p = < 0.050$). It was found that people with the chronic disease and aware of their health status (positive agreement), and those with negative objective measure but positive self-reported disease (negative disagreement), were more likely to access healthcare services (83% of who had a positive agreement for chronic lung disease) and to be satisfied with the quality of care provided (82% of who had a negative disagreement for hypertension), compared to those who assumed they were healthy but had a chronic disease.

Conclusions and Recommendations: Although agreement between the self-reported and objective measurement of chronic disease was found to be poor to moderate, we found that some socioeconomic demographic characteristics, such as educational and economic level, did not affect the agreement of measure tools for hypertension and diabetes, except for sex, age and region. Contrary to our expectations, disagreement between objective and self-reported measures in chronic diseases appears not to significantly impact on the quality of healthcare services and health status. The high use of health care services in participants with positive disagreement may result in unnecessary healthcare service costs required to treat chronic diseases. The implications on health services use and planning of this disagreement in the diagnosis of chronic diseases have been scarcely addressed in the literature, therefore, the results from our study need to be taken as a first approximation to this issue. Provided the unexpected results, we recommend examining closely the integrity of the dataset before giving full value about the validity of them.

Keywords: self-report, objective measures, chronic disease, agreement, sociodemographic variables

1. Introduction

Globally, disease patterns have shifted from infectious to noncommunicable diseases, and chronic disease in particular, over the last few decades. The burden of these diseases in developed and developing countries is increasing. The World Health Organization [WHO] (2011) states that chronic diseases are associated with high morbidity, mortality and disability. For example, Wu and Green (2000) reported that 133 million Americans had at least one chronic disease in 2005 and it was estimated that the figure would reach 157 million in 2020. Therefore, the cost of the burden of chronic disease will have markedly increased to 78% of total health spending by 2023 (Bodenheimer, Chen, & Bennett, 2009). Thus, the cost of managing these diseases is increasing globally and more accurate measurement of these diseases is required in order to secure better health outcomes.

Self-report questionnaires are usually used in epidemiological studies to acquire health data. The data may be collected by any one of several self-report methods, including face-to-face or telephonic interviews, as well as mail-back questionnaires. The advantage of self-report questionnaires is that they are a simple and efficient way of obtaining views and opinions directly from respondents (Paulhus, Vazire, Robins, Fraley, & Krueger, 2007). However, disadvantages include the fact that respondents may not be able to provide accurate responses owing to poor memory, cognitive bias, impression management or mood (McDonald, 2008). Thus, the accuracy of this method has been found to vary from one study to another. Huerta, José Tormo, Egea-Caparrós, Ortolá-Devesa, and Navarro (2009) state that the accuracy of self-reports in the health field depends on the characteristics of a population, the nature of the disease, and the respondents' health status or symptoms. Similarly, the accuracy of self-reports is reliant on the recall ability and knowledge of health-related information of the respondents (Goldman, Lin, Weinstein, & Lin, 2003). Therefore, although data collection through self-reports can be quick and inexpensive, its accuracy relies on the ability of respondents to recall facts and have knowledge of their disease.

Although substantial disagreement between self-reports and an objective diagnosis of chronic diseases has been demonstrated in many studies, the consequences of this discrepancy on health status or planning have not been elucidated. Merkin et al. (2007) reported that the effects of incongruity between self-reporting and the objective measurement of disease can vary from the development of specific disease to ways in which health status or health planning are affected. Further studies are warranted in this regard.

The impact of a discrepancy between self-reporting measures and an objective diagnosis of chronic disease on healthcare service quality, health status, health service utilisation, quality of life, health system responsiveness, household income and expenditure, and family support are explored in the current study. An evaluation is also conducted of the accuracy of a self-report questionnaire in diagnosing chronic diseases as this questionnaire is currently being used to inform health planning in the country.

1.1 Aim

The overall study aim was to examine the effect of incongruity between the self-reported and objective measurement (i.e., clinical diagnosis) of chronic diseases (specifically, diabetes and hypertension) on health service utilisation, quality of life, health status, health system responsiveness, household income and expenditure, and familial support (network).

1.2 Specific Objectives

The specific study objectives were to:

- Measure the extent of disagreement between self-reporting of chronic disease and the results of a medical examination.
- Determine whether or not sociodemographic risk factors impacted on the resultant discrepancy between the self-reported and objective measurement of chronic disease.
- Examine the impact of the disparity between the self-reported and objective measurement of chronic disease on the healthcare service and health status.

1.3 Significance of the Study

This research was the first to examine the effects of the disparity between self-reports of disease and an objective diagnosis on healthcare services and health status in Oman, and was among the first to explore this subject matter worldwide. The findings of this study may be useful in understanding the impact of disagreement between the self-reported and objective measurement of chronic disease on health plans in Oman. Therefore, this research may help with determining the accuracy of self-reported data which are being used to inform the country's health plans. This could help to ensure the success of the health plan and economise the use of health resources owing to the use of accurate data. It could also provide greater understanding of the risk factors associated with specific chronic diseases, thereby reducing their burden on the country by alleviating costs and reducing the rate of prevalence. The Ministry of Health in Oman provided approval for this study to be conducted because of utilisation of the data from the 2008 Oman World Health Survey [OWHS].

2. Methodology

2.1 Study Design and Setting

Secondary data from the most recent OWHS, for which data were readily available (2008), were analysed in this cross-sectional study. This survey was conducted in community households and targeted Omani and non-Omani individuals aged ≥ 20 years. It was part of the World Health Survey to collect information about the health of populations in different countries worldwide. A multi-stage stratified cluster design was used and 5000 eligible subjects were selected. The survey covered 10 regions at the time of sampling, with a near-equal sample selected from each strata (with the exception of urban Muscat, for which the sample size was larger). The size of the sample was calculated using data taken from the 2003 Oman census. The targeted number of households was 5846, spread across 10 rural and urban regions.

2.2 Data Collection From the 2008 Oman World Health Survey

Secondary data from the 2008 OWHS were collected via face-to-face interviews and measurements were taken of weight, height and blood pressure. Blood samples were collected by laboratory technicians and nurses during the interviews. A 95% household response rate was recorded for the survey. Three questionnaires were used to collect the data:

a) Omani and non-Omani individual household questionnaire.
b) A reproductive health questionnaire.
c) A genetic disorder and congenital anomalies questionnaire.

The household questionnaires contained sections on the household roster, housing, a consent form for participation in the study, household expenditure, interviewer observations, identification and re-contact information, assets, household income and transfer in/out families. The individual questionnaires included questions about the background of the respondents, health status, work history and benefits, performance tests (weight, height, and hip and waist circumference), biomarkers (cognition, hand grip, lung function, timed walk, blood pressure (BP), visual ability, fasting blood test, fasting glucose, total cholesterol, triglycerides, low-density lipoprotein (LDL), high-density lipoprotein (HDL), haemoglobulin A_{1c} (HbA_{1c}), self-reported chronic diseases, health services coverage and various quality of life factors.

2.3 Definition of Variables

The following variables were used in the research:

1) *Self-reporting of diabetes mellitus and hypertension:* Information on diabetes mellitus and hypertension was taken directly from the questionnaire.

2) *Objective measurement for a diagnosis of diabetes mellitus*: Blood sugar levels were measured using a fasting blood test. The respondent was diagnosed with diabetes mellitus if his or her blood sugar level was ≥ 7 mmol/L.

3) *Objective measurement for a diagnosis of hypertension:* Hypertension was determined using an upper arm BP monitor. The respondent was considered to have hypertension if his or her BP was ≥ 140/90 mmHg.

4) *Health service utilisation:* An attempt was made to identify whether or not any of the respondents required health care. The type of healthcare provider needed was identified. The respondents' experiences of receiving health care from healthcare workers, clinics, hospitals and the healthcare system in general were explored. Questions were also asked about healthcare utilisation to determine whether or not the respondents had needed or received healthcare (out- or inpatient services) over the last three years.

5) *Quality of life:* The well-being of the respondents in terms of health, finances and happiness was evaluated. Respondents' satisfaction with monetary sufficiency, their social relationships, health, level of physical activity and overall satisfaction with life was measured using a 5-point Likert scale.

6) *Health status:* The level of respondent's health (ranging from very bad to excellent) was assessed by measuring their ability to perform vigorous activity, practice self-care and secure bodily health.
7) *Health system responsiveness:* The ability of the health system to meet the expectations of the population by implementing ongoing improvements was explored. The degree to which the health system was responsive was reflected in the respondents' perspectives, based on their reported past experiences. Questions were asked that covered seven domains of autonomy, choice, confidentiality, communication, dignity, quality of basic amenities and prompt attention. The responsiveness of the health system (out- and inpatient healthcare services) was rated and assessed by the study participants. Their satisfaction in each domain was rated using a scale ranging from 1-5, where "5" represented the poorest level of service and "1" an optimal level of service.
8) *Household income:* Information was sought on the combined incomes of adults in the household and about their properties.
9) *Household expenditure:* The study participants were asked about what was spent in their household to meet their daily needs (i.e., rent, food, housing, cars and clothing).
10) *Familial support:* Questions were asked about familial support to assess whether or not the household had received help in the last 12 months from either family or friends (living elsewhere), and to determine the various ways in which they supported and helped one another. The financial, emotional and physical needs of either children or adults with disabilities or other needs were covered in this section. The transfer of any type of support from outside the respondent's household into it was explored through these questions.

2.4 Analysis Plan

Initially, the sociodemographic variables were described for each type of measurement (self-reported or objective measures) separately from the disease (diabetes mellitus or hypertension). The normally distributed continuous variables were described as means and standard deviations. The categorical variables were depicted as proportions.

To determine the extent of disagreement between the self-reported and objective diagnoses, agreement between the self-reporting of chronic diseases (diabetes mellitus and hypertension) and the results of the medical examination were calculated using kappa ($\varkappa$) statistics.

Sociodemographic risk factors for the self-reported and objective measures used for each disease were identified to address the second objective (to determine whether or not sociodemographic risk factors impacted on the resultant discrepancy between the self-reported and objective measurement of chronic disease). In each case, the explanatory variables included age, gender, residence, nationality, education level, income, marital status and family size. Univariate analysis was conducted initially to determine associations between the variables and the outcome. Thereafter, significant variables were included in multivariate analysis performed using logistic regression.

The impact of the disparity between the self-reported and objective diagnoses of chronic disease on healthcare services and health status (the third objective) was also examined with logistic regression, using the variables, health service utilisation, quality of life, health status, health system responsiveness, household income and expenditure, and familial support (network). Univariate analysis was conducted initially for each type of measurement (self-reported or objective measures) of each disease. Significant variables identified in the univariate analysis were incorporated into the multivariate analysis.

3. Results

3.1 Selection of Study Population

The original sample size was 4717, as determined from the WHO – Oman 2008 data; however, the target sample for this study was calculated based on the following criteria: Only Omanis aged 20 years and older were considered. Therefore, the sample size in this study is 3524 people.

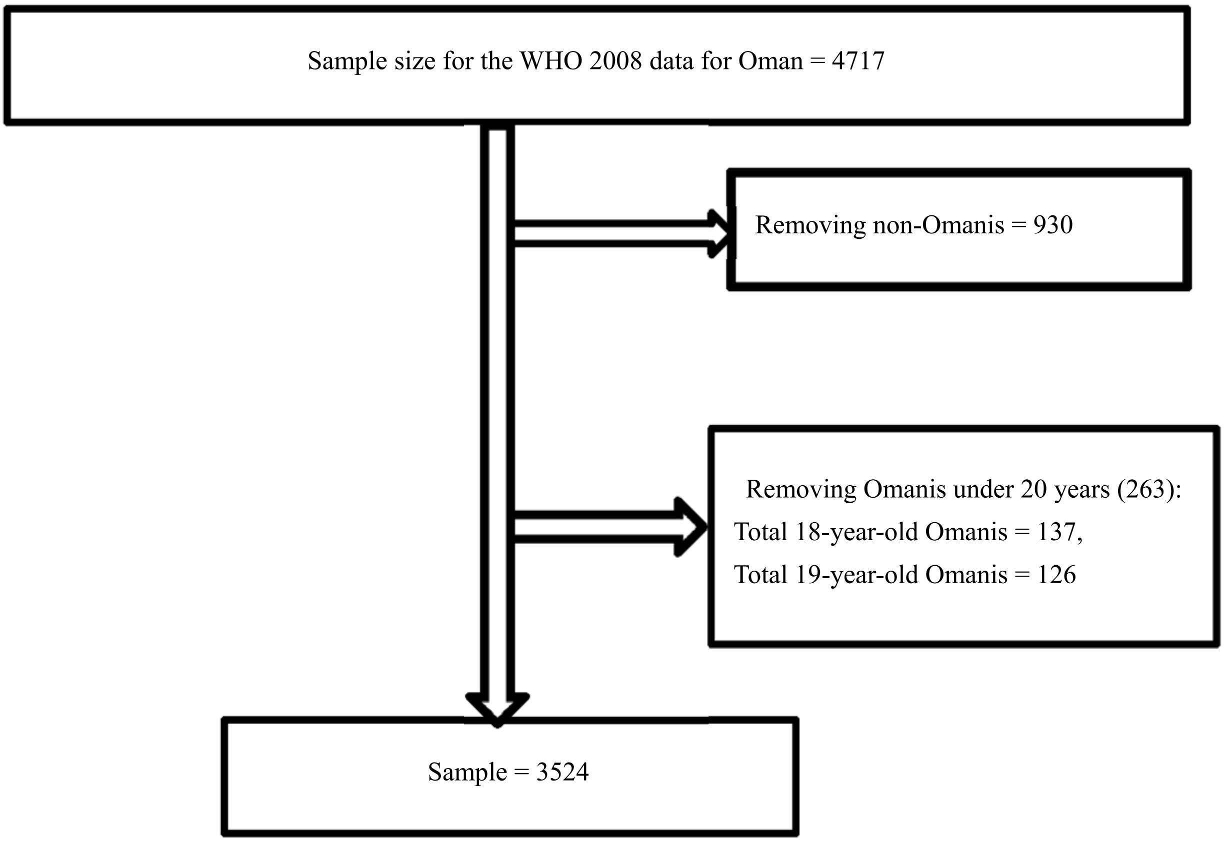

Figure 2. Flowchart of selection criteria for the WHO health survey – Oman 2008 for this study

3.2 Characteristics of the Sample Population in the Study

As shown in Table 1, the sample size was 3524 Omanis aged 20 years and older. The percentage of participating males was less than that of females by about 4%. Around 54% of the participants were from urban areas and 46% of them were from rural areas. The highest percentage of participants belonged to the age group of 20–29 years (36.35%), while the lowest percentage was in the 60 years and older group (12.8%). In addition, most participants were married (65.61%), and the percentages of married people of both sexes were approximately the same. In terms of the level of education, most participants in this sample had a high school education or less (85.1%). The percentage of males with college and high school (17.1%) was higher than that of females (12.1%), whereas the percentage of females was higher in the high school and lower group by about 5%. In terms of their first languages, both sexes exhibited the same percentages of Arabic (98.6%) and non-Arabic (1.4%) speakers. Most respondents had a poor economic level (53.5%), while both sexes had approximately the same percentages at all three economic levels.

Table 1. Sociodemographic Characteristics* of the Studied Omani Population Aged 20 Years and Older in 2008

	2008		
	Males **1688 (47.90%)**	**Females** **1836 (52.10%)**	**Overall** * ***N* = 3524**
Area			
Urban	888 (52.61)	998 (54.36)	1886 (53.52)
Rural	800 (47.39)	838 (45.64)	1638 (46.48)
Age group			
20–39	1009 (59.8)	1156 (63)	2165 (61.4)
40–59	425 (25.2)	484 (26.4)	909 (25.8)
60+	254 (15)	196 (10.7)	450 (12.8)
Marital status			
Married	1092 (64.69)	1220 (66.45)	2312 (65.61)
Not married	596 (35.3)	616 (33.6)	1212 (34.4)
Educational level			
Secondary and lower	1036 (82.9)	986 (87.6)	2022 (85.1)
College and high school	213(17.1)	140 (12.4.)	353 (14.9)
First language			
Arabic	1665 (98.6)	1810 (98.6)	3475 (98.6)
Non-Arabic	23 (1.4)	26 (1.4)	49 (1.4)
Economic Status			
Poor	885 (25.1%)	999 (28.3%)	1884 (53.5%)
Middle level	333 (9.4%)	366 (10.4%)	699 (19.8%)
Rich	470 (13.3%)	471 (13.4%)	941 (26.7%)

*Values are presented as frequency (%) per sex.

3.3 Extent of Agreement between Self-Reporting and Objective Measures

The analysis of the agreement between the self-reporting and objective measures showed that there were negative poor to positive moderate levels of agreement for noncommunicable diseases, such as hypertension, diabetes, chronic lung disease and asthma (Table 2). Our data comprised three readings for systolic and diastolic blood pressure at baseline, after 1 minute and after 2 minutes. We calculated the average to measure the participants' blood pressure. Therefore, we found that hypertension disease exhibited poor agreement $\varkappa = 0.141$, $p < 0.001$. The highest agreement was negative (78%) and the lowest was positive (3%) for this disease. In contrast, diabetes had moderate agreement, $\varkappa = 0.402$, $p < 0.001$. The agreement for diabetes was higher for the negative (84%) results than the positive (5%) ones. Negative agreement was shown for both hypertension (78%) and diabetes (84%) compared with other values of agreement and disagreement. However, both diseases had a value of negative agreement greater than that for positive agreement, and the value of positive disagreement was higher than that of negative agreement.

Both chronic lung disease and depression showed poor disagreement, $\varkappa = –0.001$, $p = 0.053$ and $\varkappa = –0.012$, $p < 0.001$, respectively. The negative agreement was the highest value, whereas the value of negative disagreement was lower than that of positive disagreement. The $\varkappa$ for asthma disease was zero, $p = 0.975$, which means that there was no relationship between self-reporting and objective measures for this disease.

Table 2. Agreement between Self-reporting and Objective measures for Chronic Diseases

Chronic disease	Agreement		Disagreement		Kappa (*p*-value)
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	101 (3%)	2649 (78%)	433 (13%)	206 (6%)	0.141 (<0.001)
Diabetes	122 (4.5%)	2347 (98.6%)	234 (8.5%)	34 (1.4%)	0.402 (<0.001)
Chronic lung disease	6 (0.2%)	3245 (92.4%)	222 (6.3%)	38 (1.1%)	0.001 (0.053)
Depression	49 (1.4%)	3138 (89.1%)	319 (9.10%)	16 (0.50%)	0.012 (<0.001)
Asthma	7 (0.2%)	3181 (90.6%)	221 (6.30%)	102 (2.90%)	0.00 (0.975)

4.3.1 Agreement Between Self-Reporting and Objective Measures for Risk Factors Related to Hypertension and Diabetes

We analysed the level of agreement between self-reporting and objective measures for hypertension and diabetes with other factors (e.g. age group, sex, region, marital status and first language), as these diseases exhibited the lowest and highest positive levels of agreement in our results. Omani adult females were 36% less likely to exhibit disagreement between self-reporting and objective measures for hypertension compared with Omani adult males, p <0.001, 95% CI (23%, 46%) (Table 3). People who lived in urban areas were 11% more likely to exhibit disagreement in this relationship, 95% CI (0.07%, 32%). Moreover, the study revealed that adults aged 40–59 years were 2.75 times more likely to exhibit disagreement compared with adults aged 20–39 years, 95% CI (2.26, 3.35). In contrast, older people (≥60 years) were 3.73 times more likely to exhibit disagreement compared with 20- to 30-year-old adults, 95% CI (2.94, 4.74).

Table 3. Univariate and Multivariate Predictors of Disagreement Concerning Hypertension

Risk factors		Agreement	Disagreement	Univariate		Multivariate	
				OR, 95% CI	***p*-value**	**OR, 95% CI**	***p*-value**
Sex	Male	1288 (46.07%)	366 (57.01%)				
	Female	1508 (53.93%)	276 (42.99%)	0.64, (0.54, 0.77)	<0.001	0.42, (0.33, 0.54)	<0.001
Area	Rural	1308 (46.78%)	284 (44.24%)				
	Urban	1488 (53.22%)	358 (55.76%)	1.11, (0.93, 1.32)	0.244	-	-
Age	20–39	1864 (66.67%)	254 (39.56%)				
	40–59	643 (23.00%)	241 (37.54%)	2.75, (2.26, 3.35)	<0.001	2.24, (1.68, 3.00)	<0.001
	60+	289 (10.34%)	147 (22.90%)	3.73, (2.94, 4.74)	<0.001	3.26, (1.51, 7.06)	0.003
Marital status	Not Married	934 (34%)	228 (35.7%)				
	Married	1816 (66.00%)	411 (64.30%)	1.07, (0.89, 1.28)	0.481	-	-
Educational level	Secondary and lower	1687 (85.20%)	295 (85.30%)				
	College and high school	293 (14.80%)	51 (14.70%)	0.99, (0.72, 1.37)	0.961	-	-
First language	Arabic	2759 (98.68%)	634 (98.75%)				
	Non-Arabic	37 (1.32%)	8 (1.25%)	1.82, (0.52, 6.39)	0.351	-	-
	Poor	1497 (53.54%)	338 (52.65%)				
Economic status	Middle level	555 (19.85%)	126 (19.63%)	1.01, (0.80, 1.26)	0.962	-	-
	Rich	744 (26.61%)	178 (26.82%)	1.06, (0.20, 0.25)	0.560	-	-

The analysis of disagreement concerning the risk factors for diabetes showed that urban people had 51% more disagreement for this disease, $p = 0.002$, 95% CI (17%, 95%) (Table 4). Participants aged 40–59 years were 3.03 times more likely to exhibit disagreement concerning diabetes compared with adults aged 20–39 years, $p < 0.001$, 95% CI (2.84, 4.01). Moreover, elderly people (≥60 years) were 3.17 times more likely to have disagreement than adults under 40 years were, 95% CI (2.28, 4.48).

Table 4. Univariate and Multivariate Predictors of Disagreement Concerning Diabetes

Risk factors		**Agreement**	**Disagreement**	**Univariate**		**Multivariate**	
				OR, 95% CI	***p*-value**	**OR, 95% CI**	***p*-value**
Sex	Male	1119 (45.51%)	140 (50.36%)				
	Female	1340 (54.49%)	138 (49.64%)	0.82 (0.64, 1.05)	0.124	0.58, (0.40, 0.85)	0.005
Area	Rural	1166 (47.42%)	104 (37.41%)				
	Urban	1293 (52.58%)	174 (62.59%)	1.51, (1.17, 1.95)	0.002	1.73, (1.17, 2.55)	0.006
Age	20–39	1592 (64.74%)	104 (37.41%)				
	40–59	587 (23.87%)	116 (41.73%)	3.03, (2.84, 4.01)	<0.001	2.32, (1.53, 3.52)	<0.001
	60+	280 (11.39%)	58 (20.86%)	3.17, (2.28, 4.48)	<0.001	-	-
Marital status	Not Married	860 (34.97%)	85 (30.58%)				
	Married	1599 (65.03%)	193 (69.42%)	0.82, (0.63, 1.07)	0.144	0.64, (0.42, 0.97)	0.036
Educational level	College and high school	1464 (84.92%)	113 (83.09%)				
	Secondary and lower	260 (15.08%)	23 (16.91%)	1.15, (0.72, 1.83)	0.567	-	-
First language	Arabic	2435 (99.02%)	274 (98.52%)				
	Non-Arabic	24 (0.98%)	4 (1.44%)	0.62, (0.17, 2.28)	0.470	-	-
Economic status	Poor	1293 (52.58%)	149 (53.60%)				
	Middle	494 (20.09%)	61 (21.94%)	1.07, (0.78, 1.47)	0.430	-	-
	Rich	672 (27.33%)	68 (24.46%)	0.88, (0.65, 1.19)	0.398	0.63, (0.40, 0.99)	0.043

4.4 Implications of Disagreement between Self-reporting and Objective Measures for Chronic Diseases

In this study, chi- square was used assess the relationship concerning disagreement between self-reporting and objective measures for chronic diseases, with six independent variables. These variables are family support, health system responsiveness, health services utilisation, quality of life, household income and household expenditure. The implications of disagreement for chronic diseases are measured and evaluated in this part of the study.

4.4.1 Family Support

A series of questions was asked in the survey to investigate the presence of family members living outside the household who provide support and financial, social, health, physical and personal care. In this part, we investigate the associations concerning the agreement between diseases and types of family support.

4.4.1.1 Financial Care

Information was gathered on financial care provided by family members and friends, specifically those not living in the same household as the respondents. Financial care included support by providing cash or paying for fees, medicines, food and bills. The question was, '*In the last 12 months, has anyone in the household received any financial or in-kind assistance from your family (children, siblings or parents) and relatives (other kin) who do not live with you?*'

This study found that people who were sick with chronic lung disease and asthma and knew about their health conditions had not received any financial support from family members living outside the household or friends in the last year (Table 5). Overall, those who had chronic diseases and knew about their illness were less likely to receive the financial support. There was no significant overall increase in the agreement and disagreement levels for all the diseases. Respondents with chronic diseases and who felt sick did not receive significantly greater financial support compared with those who were free from these diseases and felt healthy. In addition, about 83% of those who reported being ill with asthma but were in fact free of this disease had financial support from their family members and friends during the last year.

Table 5. Financial Care from Family Members and Friends in the Last Year

Disease	Agreement		Disagreement		Chi-square (*p*-value)
	Positive	Negative	Positive	Negative	
Hypertension	3 (2.97%)*	69 (2.60%)	7 (1.62%)	4 (1.94%)	1.1 (0.77)
Diabetes	2 (1.64%)	64 (2.73%)	7 (2.99%)	1 (2.94%)	3.89 (0.274)
Chronic lung disease	0 (0.00%)	77 (2.37%)	4 (1.80%)	2 (5.26%)	2.89 (0.236)
Depression	2 (4.08%)	59 (1.88%)	23 (7.21%)	0 (0.00%)	3.68 (0.298)
Asthma	0 (0.00%)	77 (2.42%)	4 (1.81%)	3 (82.35%)	3.33 (0.343)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who received financial care in the last year out of the total number of respondents with positive or negative agreement/disagreement.

4.4.1.2 Social/Emotional Care

The data on social/emotional, health, physical and personal care were collected by asking the respondents about the types of care they were receiving from their family and friends: '*What type of health care/support have you received from the provider to family and friends?*' In OWHOS, social/emotional care includes social activities, counselling and spending time with friends.

An unexpected result was that among those who exhibited agreement for these chronic diseases, people who did not have the diseases perceived that they had more social support from their families compared with those who had the diseases and felt ill (Table 6). Moreover, of those who exhibited disagreement for these diseases, we found that people who thought they were sick but were not had less social care from their family compared with those who were sick but felt well. These results were unexpected because people who are sick or feeling sick should be receiving more support than people who are well.

Table 6. Social/Emotional Care from Family Members and Friends in the Last Year

Disease	Agreement		Disagreement		Chi-square (*p*-value)
	Positive	Negative	Positive	Negative	
Hypertension	5 (4.95%)*	102 (3.85%)	16 (3.70%)	5 (2.43%)	4.25 (0.236)
Diabetes	4 (3.28%)	102 (4.35%)	5 (2.14%)	1 (2.94%)	2.22 (0.527)
Chronic lung disease	0 (0.00%)	112 (3.45%)	10 (4.50%)	8 (21.05%)	2.66 (0.264)
Depression	2 (4.08%)	97 (3.09%)	32 (10.03%)	0 (0.00%)	3.17 (0.366)
Asthma	0 (0.00%)	112 (3.52%)	10 (4.52%)	8 (7.84%)	2.89 (0.460)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who received social/emotional care in the last year out of the total number of respondents with positive or negative agreement/disagreement.

4.4.1.3 Health Care

The term 'health care' in the survey included changing bandages, arranging healthcare providers and administering medicines. Table 7 presents health care provided by family members of those who had chronic disease or felt ill. Diabetic cases who believed they had the disease had more healthcare support from family compared with people who lived without diabetes and felt healthy. Moreover, those who felt ill with diabetes but did not have the disease had more health support compared to those who felt well, even if they were ill.

Table 7. Health Care from Family Members and Friends in the Last Year

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	2 (1.98%)*	86 (3.25%)	22 (5.08%)	0 (0.00%)	0.05 (0.997)
Diabetes	7 (5.74%)	98 (4.18%)	12 (5.13%)	6 (17.65%)	1.43 (0.698)
Chronic lung disease	0 (0.00%)	113 (3.48%)	11 (4.95%)	1 (2.63%)	0.73 (0.694)
Depression	1 (2.04%)	96 (3.06%)	27 (8.46%)	2 (12.50%)	3.05 (0.384)
Asthma	0 (0.00%)	212 (6.66%)	11 (4.98%)	6 (5.88%)	3.73 (0.292)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who received health care in the last year out of the total number of respondents with positive or negative agreement/disagreement.

4.4.1.4 Physical Care

Another type of family support used in the OWHS was physical care. This term included support by performing household chores and providing transportation. As expected, people with chronic diseases received more physical care than those without, but people who had diabetes (1.64%) and asthma (0%) who knew about their disease were less likely to receive physical care compared with people who did not have these diseases (3.71% and 3.02%, respectively; Table 8). In contrast, those who felt sick with diabetes (5.88%) and chronic lung disease (5.26%) but did not actually have the diseases received less physical care compared with those who believed they were well but had the disease (2.14% and 4.50%, respectively).

Table 8. Physical Care from Family Members and Friends in the Last Year

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	5 (4.95%)*	87 (3.28%)	12 (2.77%)	5 (2.43%)	0.75 (0.862)
Diabetes	2 (1.64%)	87 (3.71%)	5 (2.14%)	2 (5.88%)	0.58 (0.902)
Chronic lung disease	0 (0.00%)	98 (3.02%)	10 (4.50%)	2 (5.26%)	1.08 (0.583)
Depression	2 (4.08%)	86 (2.74%)	22 (6.90%)	0 (0.00%)	2.18 (0.535)
Asthma	0 (0.00%)	96 (3.02%)	10 (4.52%)	4 (3.92%)	4.48 (0.214)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who received physical care in the last year out of the total number of respondents with positive or negative agreement/disagreement.

4.4.1.5 Personal Care

The last type of family support was personal care, which included assistance related to bathing, eating, toileting, dressing, incontinence and moving around. About 29% of people who had asthma and knew about their health conditions received personal care from their families compared with people with other chronic diseases. In contrast, those who had diabetes (0.82%) and chronic lung disease (0%) and felt ill did not receive this type of care. This means that asthma cases were in high need of personal care, while diabetics and chronic lung disease patients did not need this care. In addition, people who felt ill with diabetes but were well (about 9%) had a higher need for personal care than people who felt ill with other chronic diseases did.

Table 9. Personal Care from Family Members and Friends in the Last Year

Disease	Agreement		Disagreement		Chi-square (*p*-value)
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	7 (6.93%)*	85 (3.21%)	9 (2.08%)	6 (2.91%)	0.88 (0.831)
Diabetes	1 (0.82%)	82 (3.49%)	3 (1.28%)	3 (8.82%)	6.23 (0.101)
Chronic lung disease	0 (0.00%)	95 (2.93%)	12 (5.41%)	1 (2.63%)	3.09 (0.213)
Depression	3 (6.12%)	84 (2.68%)	22 (6.90%)	0 (0.00%)	3.45 (0.327)
Asthma	2 (28.57%)	93 (2.92%)	10 (4.52%)	3 (2.94%)	6.95 (0.073)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who received personal care in the last year out of the total number of respondents with positive or negative agreement/disagreement.

4.4.2 Health System Responsiveness

Health system responsiveness is the ability of the system to respond to patients' expectations in the environment in which these patients are treated (Robone, Rice, & Smith, 2011). For these results, respondents were asked to rate the system responsiveness for inpatient and outpatient healthcare services. The data were collected by asking the question, '*For your last visit to a health care provider, how would you rate the following variables: cleanliness, time spent waiting, being treated respectfully, clear explanations, being involved in decisions, ease of finding a provider, ability to talk privately?*', with a score from 1 (very good) to 5 (very bad) for each variable.

There was high satisfaction concerning the cleanliness of the health facilities in Oman among people with chronic diseases who knew about their illness compared with those who were in good health and felt healthy (Table 10). In addition, 71.65% of depression cases who thought they were in good health agreed that the health facilities had a high level of cleanliness compared with about 69% of those who perceived they had depression but did not.

Table 10. Responsiveness of the Healthcare Provider Concerning Cleanliness in the Health Facility

Disease	Agreement		Disagreement		Chi-square (p-value)
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	79 (78.22%)*	1566 (59.12%)	210 (48.50%)	167 (81.07%)	2.44 (0.490)
Diabetes	99 (81.15%)	1368 (58.29%)	133 (56.29%)	24 (70.59%)	2.95 (0.399)
Chronic lung disease	4 (66.67%)	1906 (58.74%)	131 (59.01%)	28 (73.68%)	1.16 (0.762)
Depression	41 (83.67%)	1796 (57.23%)	227 (71.16%)	11 (68.75%)	4.05 (0.257)
Asthma	6 (85.71%)	1857 (58.71%)	130 (58.82%)	81 (79.41%)	0.50 (0.918)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who were satisfied with the cleanliness of the health facility over the total number of respondents with positive or negative agreement/disagreement.

Wait times for accessing health care was an issue for chronic lung disease cases who knew about their health conditions. Half waited for long periods before receiving health care (Table 11). In contrast, most patients with this disease were satisfied with wait times for treatment in Omani health facilities.

Table 11. Responsiveness of Healthcare Provider Wait Times

Disease	Agreement		Disagreement		Chi-square (*p*-value)
	Positive	Negative	Positive	Negative	
Hypertension	76 (75.25%)	1479 (55.83%)	203 (46.88%)	158 (76.70%)	0.65 (0.884)
Diabetes	94 (77.05%)	1305 (55.60%)	126 (53.85%)	24 (70.59%)	0.98 (0.806)
Chronic lung disease	3 (50.00%)*	1805 (55.62%)	125 (56.31%)	28 (73.68%)	4.48 (0.214)
Depression	37 (75.51%)	1712 (54.56%)	207 (64.89%)	11 (68.75%)	3.16 (0.368)
Asthma	5 (71.43%)	1762 (55.39%)	124 (56.11%)	75 (73.53%)	1.73 (0.630)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who were satisfied wait times in clinics in the last year over the total number of respondents with positive or negative agreement/disagreement.

Both people who were ill with chronic diseases and knew about their health condition and those who thought they were ill but were not exhibited a high agreement about the respect that healthcare workers showed during treatment (Table 12).

Table 12. Responsiveness of the Healthcare Provider Concerning Treating Patients Respectfully

Disease	Agreement		Disagreement		Chi-square (*p*-value)
	Positive	Negative	Positive	Negative	
Hypertension	81 (80.20%)	1575 (59.46%)	216 (49.88%)	169 (82.04%)	4.75 (0.191)
Diabetes	96 (78.69%)*	1388 (59.14%)	136 (58.12%)	24 (70.59%)	5.76 (0.124)
Chronic lung disease	4 (66.67%)	1925 (59.32%)	132 (59.46%)	27 (71.05%)	1.44 (0.697)
Depression	38 (77.55%)	1817 (57.90%)	227 (71.16%)	12 (75.00%)	11.13 (0.011)
Asthma	5 (71.43%)	1876 (58.98%)	132 (59.73%)	80 (78.43%)	15.40 (0.002)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who had been treated respectfully out of the total number of respondents with positive or negative agreement/disagreement.

The explanations during treatment provided in Omani health facilities usually met the expectations of people who had chronic diseases and knew about their illness (Table 13). We can also see from the table that about 69% of hypertension and depression cases were satisfied with the explanation provided to them.

Table 13. Responsiveness of the Healthcare Provider Concerning Clear Explanations

Disease	Agreement		Disagreement		Chi-square (*p*-value)
	Positive	Negative	Positive	Negative	
Hypertension	78 (77.23%)*	1538 (58.06%)	209 (78.24%)	162 (78.64%)	0.23 (0.973)
Diabetes	96 (78.69%)	1345 (57.31%)	131 (55.98%)	24 (70.59%)	0.44 (0.931)
Chronic lung disease	4 (66.67%)	1877 (57.84%)	128 (57.66%)	25 (65.79%)	3.64 (0.304)
Depression	38 (77.55%)	1773 (56.50%)	218 (68.34%)	11 (68.75%)	3.30 (0.349)
Asthma	6 (85.71%)	1826 (57.40%)	127 (57.47%)	80 (78.43%)	0.275 (0.965)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who received clear explanations out of the total number of respondents with positive or negative agreement/disagreement.

The respondents who had chronic diseases and knew they were sick expressed satisfaction about the decisions made for treatment (Table 14). In addition, approximately 69% of depression cases who thought they were healthy and 69% of people who thought they had depression but were healthy perceived that good treatment decisions were made.

Table 14. Responsiveness of the Healthcare Provider Concerning Involvement in Decisions (Experience with Making Treatment Decisions)

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	79 (78.22%)*	1523 (57.49%)	207 (47.81%)	164 (79.61%)	1.54 (0.673)
Diabetes	96 (78.69%)	1339 (57.05%)	130 (55.56%)	23 (67.65%)	1.25 (0.742)
Chronic lung disease	4 (66.67%)	1859 (57.29%)	129 (58.11%)	27 (63.16%)	1.14 (0.768)
Depression	37 (75.51%)	1756 (55.96%)	220 (68.97%)	11 (68.75%)	2.85 (0.416)
Asthma	6 (85.71%)	1809 (56.87%)	128 (57.92%)	80 (78.43%)	1.42 (0.70)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who had been involved in decisions out of the total number of respondents with positive or negative agreement/disagreement.

The expectations of people who were ill and aware of their disease were met, as well as those of people who thought they were sick but were in good health; they were happy with the ease of finding treatment (Table 15). However, we found that respondents who had asthma and knew about their condition were less likely to trust their healthcare providers enough to talk about their private issues with them (Table 16).

Table 15. Responsiveness of the Healthcare Provider Concerning Ease of Access (Ease of Finding a Satisfactory Provider)

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	79 (78.22%)*	1521 (57.42%)	203 (46.88%)	165 (80.10%)	3.78 (0.286)
Diabetes	95 (77.87%)	1339 (57.05%)	128 (54.70%)	24 (70.59%)	0.54 (0.911)
Chronic lung disease	4 (66.67%)	1853 (57.10%)	128 (57.66%)	27 (71.05%)	0.78 (0.854)
Depression	40 (81.63%)	1751 (55.80%)	214 (67.08%)	12 (75.00%)	3.16 (0.368)
Asthma	6 (85.71%)	1804 (56.71%)	127 (57.47%)	80 (78.43%)	1.10 (0.777)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who had ease of finding a health provider over the total number of respondents with positive or negative agreement/disagreement.

Table 16. Responsiveness of the Healthcare Provider Concerning Talking Privately (Talking Privately with Providers)

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	79 (78.22%)	1563 (59.00%)	209 (48.27%)	168 (81.55%)	4.31 (0.230)
Diabetes	98 (80.33%)	1370 (58.37%)	134 (57.26%)	23 (67.65%)	3.83 (0.280)
Chronic lung disease	4 (66.67%)	1906 (58.74%)	133 (59.91%)	28 (73.68%)	4.42 (0.220)
Depression	39 (79.59%)	1797 (57.27%)	224 (70.22%)	12 (75.00%)	1.44 (0.696)
Asthma	6 (59.71%)*	1853 (58.25%)	132 (59.73%)	80 (78.43%)	4.04 (0.267)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who were satisfied with their ability to talk privately with the healthcare provider out of the total number of respondents with positive or negative agreement/disagreement.

4.4.3 Health Service Utilisation

Health service utilisation measures the population using the available health services, including resources, physical resources and hospital resources (Gellman, 2013). The Omani world health survey collected information about this measure by asking respondents about the most recent time when they needed health care in the last 3 years. In addition, information about the need for health care was collected concerning both inpatient and outpatient cares.

4.4.3.1 Needed and Received Health Services in the Last Three Years

Table 20 shows the need of respondents for health care among the five noncommunicable diseases in the past 3 years. The respondents were asked, 'In *the last 3 years, when you needed health care, did you receive it?*', in the survey.

People who were sick with these chronic diseases and aware of their condition needed more healthcare services from health providers compared with those who did not have the diseases and felt healthy over the last 3 years (Table 17). All asthma and chronic lung disease cases who believed they had these diseases needed these services. The results showed that there was high need for health care among asthma and chronic lung disease cases who believed they had these diseases (100%), and they were asking for health care. Furthermore, we can see from Table 20 that people who were free from hypertension, diabetes, chronic lung disease and depression but felt ill had high needs to visit healthcare providers, at 93.69%, 91.18%, 89.47% and 89.22%, respectively, compared with those who thought they were healthy but were actually ill.

Table 17. Respondents Who Needed Health Care in the Past Three Years among the Five Noncommunicable Diseases

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	90 (89.11%)*	2034 (76.78%)	317 (73.218%)	193 (93.69%)	4.00 (0.261)
Diabetes	113 (92.62%)	1800 (76.69%)	175 (74.79%)	31 (91.18%)	1.25 (0.742)
Chronic lung disease	6 (100.00%)	2479 (76.39%)	174 (78.38%)	34 (89.47%)	1.17 (0.76)
Depression	45 (91.48%)	2364 (75.33%)	279 (87.46%)	13 (81.25%)	3.18 (0.365)
Asthma	7 (100.00%)	2426 (76.27%)	175 (79.19%)	91 (89.22%)	0.83 (0.842)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who needed Health Care over the total number of respondents with positive or negative agreement/disagreement.

Table 18 presents the results for respondents who had received inpatient care in the past 3 years. These data were collected by asking, '*In the last 3 years, have you ever stayed overnight in a hospital or long-term care facility?*'

The respondents who had chronic disease and felt ill had received more inpatient health care during the last 3 years compared with those who were well and felt healthy. From Table 18, it can be observed that 83.33% of the chronic lung disease cases who were aware of their illness had received health care, which shows a high rate of receiving inpatient care for these cases. In addition, about 45% of people who were free from with diabetes and chronic lung disease but felt sick received these services.

Table 18. Respondents Who Had Received Inpatient Care in the Past Three Years among the Five Noncommunicable Diseases

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	27 (26.73%)*	623 (23.52%)	56 (12.93%)	79 (38.35%)	34.82 (<0.001)
Diabetes	40 (32.79%)	545 (23.22%)	52 (22.22%)	15 (44.12%)	6.45 (0.091)
Chronic lung disease	5 (83.33%)	734 (22.62%)	51 (22.97%)	17 (44.74%)	15.49 (0.001)
Depression	17 (34.69%)	689 (21.96%)	100 (31.35%)	2 (12.50%)	8.36 (0.039)
Asthma	3 (42.86%)	718 (22.57%)	53 (23.98%)	34 (33.33%)	3.31 (0.347)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who had received inpatient care out of the total number of respondents with positive or negative agreement/disagreement.

The information on respondents who received outpatient care was collected by asking, '*Over the last 3 years, did you receive any health care NOT including an overnight stay in hospital or long-term care facility?*' As Table 19 illustrates, there was higher outpatient health service attendance by people who had chronic diseases and knew about them compared with people who were free from these diseases but felt ill. Moreover, those who were healthy but felt ill exhibited high access to these services compared with those who were ill but thought they were healthy.

Table 19. Respondents Who Received Outpatient Care in the Past Three Years in Terms of the Five Noncommunicable Diseases

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	82 (81.19%)*	1602 (60.48%)	217 (50.12%)	169 (82.04%)	38.34 (<0.001)
Diabetes	99 (81.15%)	1405 (59.86%)	136 (58.12%)	25 (73.53%)	6.70 (0.082)
Chronic lung disease	4 (66.67%)	1952 (60.15%)	133 (59.91%)	28 (73.68%)	1.17 (0.759)
Depression	41 (83.67%)	1840 (58.64%)	230 (72.10%)	12 (75.00%)	8.56 (0.036)
Asthma	6 (85.71%)	1901 (59.76%)	132 (59.73%)	83 (81.37%)	9.95 (0.019)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who had received outpatient care out of the total number of respondents with positive or negative agreement/disagreement.

4.4.4 Overall Quality of Life

In general, quality of life can be defined as the wellbeing of individuals and communities in terms of the positive and negative features of life, such as health, financial resources and happiness (Theofilou, 2013). This variable was measured in the Oman WHO survey by addressing the respondents' overall satisfaction with life, including monetary sufficiency, social relationships, health, social trust and physical activities. The information was collected by asking respondents, '*How would you rate your overall quality of life?*' the responses were given on a 5-point scale from very good (1) to very poor (5).

Table 20 shows that the Omani respondents had high satisfaction with their lives. In addition, those who were well and believed that they did not have chronic diabetes, hypertension or depression were more likely to be satisfied with their quality of life, at 99.13%, 98.47% and 99.84%, respectively, compared with respondents who had these diseases and felt ill.

Table 20. Respondents Who Were Satisfied with Their Quality of Life According to the Five Noncommunicable Diseases

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	96 (95.05%)*	2626 (99.13%)	427 (98.61%)	203 (98.54%)	23.45 (<0.001)
Diabetes	118 (96.72%)	2311 (98.47%)	233 (98.47%)	33 (97.06%)	6.91 (0.075)
Chronic lung disease	6 (100.00%)	3211 (98.95%)	218 (98.20%)	36 (94.74%)	6.91 (0.075)
Depression	45 (91.84%)	3111 (99.84%)	311 (97.49%)	15 (93.75%)	32.75 (<0.001)
Asthma	7 (100.00%)	3151 (99.06%)	219 (99.10%)	100 (98.04%)	1.62 (0.654)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who were satisfied with their quality of life out of the total number of respondents with positive or negative agreement/disagreement.

4.4.5 Household Income

Household income is a measure of the shared incomes of all people who live in the same household. This value includes every form of income, such as wages, trading and business, pensions and benefits and rentals and interest. The Oman WHO survey collected information on household income by asking, '*Thinking about the income for this household, do you believe that it is enough money to cover your daily living needs and obligations?*'

Table 21 shows that depression and chronic lung disease cases who were aware they had the disease had less income to cover their monthly needs, at 33.33% and 4.08%, respectively, compared with people who were free from these diseases and felt well. In addition, those who had hypertension, diabetes and asthma but felt healthy were more satisfied with their monthly income compared with those who had these diseases and did not feel sick.

Table 21. Respondents Who Were Satisfied with Their Monthly Income to Cover Their Needs According to the Five Noncommunicable Diseases

Disease	**Agreement**		**Disagreement**		**Chi-square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	45 (44.55%)*	1138 (42.96%)	199 (45.96%)	91 (44.17%)	8.58 (0.198)
Diabetes	56 (45.90%)	995 (42.39%)	113 (48.29%)	12 (35.29%)	3.50 (0.74)
Chronic lung disease	2 (33.33%)	1367 (42.13%)	84 (37.84%)	38 (100.00%)	6.99 (0.322)
Depression	2 (4.08%)	1397 (44.52%)	83 (26.02%)	16 (100%)	5.87 (0.438)
Asthma	7 (100.00%)	1363 (42.85%)	118 (53.39%)	6 (5.88%)	15.55 (0016)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who were satisfied with their monthly income out of the total number of respondents with positive or negative agreement/disagreement.

4.4.5 Household Expenditures

Household expenditure is the amount of spending by the members of a household to meet their daily needs, such as food, housing, clothing, education, health care, transport and taxes. A series of questions were asked about household expenditure for housing and utilities, clothing, transportation, recreation and entertainment and other expenditures in the last month in the Oman WHO survey. The currency was converted from Omani rials (OMR) to Australian dollars (AUD; 1 OMR = 3.28 AUD; (Reserve Bank of Australia, 2017).

Table 25 shows the value of expenditures from the month before the interview per respondent. Respondents who were ill with chronic lung disease were 532.82% more likely to spend money on monthly house expenditures compared with those with the other four diseases. In contrast, those with asthma were about 3% less likely to spend money on household expenditures compared with those with the other four diseases. Respondents who had asthma but thought they were well were 2.16 times more likely to spend money on household expenditure, 95% CI (1.05, 4.43), compared with those who were well but thought they had the disease. In addition, respondents who had diabetes and were aware of their disease were 41% less likely to spend money on monthly household expenditures, 95% CI (39%, 43%), compared with people who did not have the disease but thought they did.

Table 22. Household Expenditures per Respondent in the Last Month

Disease	**Agreement**		**Disagreement**		**Chi-Square (*p*-value)**
	Positive	**Negative**	**Positive**	**Negative**	
Hypertension	6047.57 (36.33%)*	3899.61 (23.42%)	3242.71 (19.48%)	3457.63 (20.77%)	0.94 (0.90, 0.98)
Diabetes	4719.46 (27.31%)	3847.82 (22.26%)	3225.89 (18.67%)	5489.47 (31.76%)	0.59 (0.57, 0.61)
Chronic lung disease	16676.07 (53.82%)	3611.39 (11.66%)	5835.96 (18.84%)	4860.87 (15.69%)	1.20 (0.85, 1.70)
Depression	2372.38 (17.32%)	3891.32 (28.41%)	2978.08 (21.74%)	4457.11 (32.54%)	0.67 (0.43, 1.04)
Asthma	395.94 (2.97%)	3660.19 (27.43%)	6348.51 (47.58%)	2937.34 (22.02%)	2.16 (1.05, 4.43)

* The percentage is the total number of respondents with positive or negative agreement/disagreement who had household expenditures over the total number of respondents with positive or negative agreement/disagreement.

5. Discussion

5.1 Summary of Findings

This study indicated that Omanis aged 20 years and older (48% male and 52% females) from the 2008 Oman World Health Survey (OWHS) had poor to moderate agreement between self-reporting for chronic diseases and objective measures. We also found that the main sociodemographic characteristics, other than sex, age and region, did not affect the agreement between self-reported and objective measures for chronic diseases, especially hypertension and diabetes.

Contrary to our expectations, we found no implications related to some of the health service quality and health status variables, such as family support and health system responsiveness, household income and household expenditure. However, there were significant implications related to other variables of health services and health status, such as quality of life and health service utilisation.

5.2 Interpretation of the Results

5.2.1 Agreement Between Self-Reporting and Objective Measures for Chronic Diseases

The results of the present study are consistent with those of previous studies, with low to moderate agreement for hypertension, $\varkappa = 0.141$; depression, $\varkappa = 0.012$; chronic lung disease, $\varkappa = 0.001$; and diabetes, $\varkappa = 0.402$. A cross-sectional study in the United States showed a low agreement between self-reported and chart data for depression in older adults, $\varkappa = 0.4$ (Leikauf & Federman, 2009). Another U.S. study reported a low agreement for depression and chronic lung disease, which may be a reflection of the underdiagnoses for these diseases or the respondents' unwillingness to seek treatment (Jiang et al., 2015). Although some studies pointed out the moderate to high agreement between self-reported depression and Medicare claims data (Carod-Artal, Coral, Trizotto, & Moreira, 2009; Stuart et al., 2014), many studies have outlined moderate to perfect agreement between self-reporting and objective measures for diabetes (Jiang et al., 2015). This result is comparable to the findings of the current study, wherein the agreement between measure tools for diabetes was moderate.

Our analysis of the agreement between self-reporting and objective measures showed a lack of agreement for asthma, $\varkappa = 0$. Previous studies showed poor to high agreement between self-reported asthma with asthma diagnosis based on health claims data (Hansen et al., 2012; Yang, To, Foty, Stieb, & Dell, 2011). This result is different from our findings, which showed a lack of agreement for asthma. Such lack of agreement may have been due to the clearly random nature of the observed allocation.

In our study, we found that people who were in good health and perceived themselves to be healthy (Negative disagreement, Tables 8–25, section 4.4) were more likely to tell the truth about their health conditions compared with those who were sick with chronic disease and felt ill. This could be because those who believed they were ill even when they were not are perceived as strong by people around them and only feel comfortable asking for help if they are sick. We found that people who were sick but felt well (positive disagreement) were more likely to lie about their health condition than those who felt ill but were in good health.

5.2.2 Identification of Risk Factors for Disagreement Between Objective and Self-Reported Measures

Contrary to our expectations, our analysis found that some socioeconomic demographic characteristics, such as educational and economic level, did not affect the agreement of measure tools for hypertension and diabetes, except for sex, age and region. An Indian study indicated that educational level and economic status have a significant association with the agreement of self-reporting and standardised measures for chronic diseases, which means that the prevalence of chronic diseases is higher in communities with less education and lower economic status (Vellakkal et al., 2013). Studies have shown that people with higher economic status and more education exhibit higher agreement than their counterparts do (Ning, Zhang, & Yang, 2016). The results of the current study are consistent with those of other previous studies that demonstrated a significant statistical association between sex, age and region and the agreement of measurement tools for hypertension and diabetes (Vellakkal et al., 2015). The results indicated that female respondents are more likely to tell the truth about their health condition compared with males. In addition, urban people are more likely to report the truth about their health condition compared with rural people. We also found that as people age, they are more likely to tell the truth about their health conditions. Therefore, this lack of consistency requires more research.

5.2.3 Implications of the Disagreement Between Self-Reporting for Chronic Diseases and Objective Measures

This report is the first study to investigate the implications of the disagreement between self-reported and objective measures for chronic diseases for health service quality and health status. Agreement or lack thereof between self-reported and objective measures had no significant implications for family support, health system responsiveness, household income or household expenditures. However, we found that people believed they were ill even when they were not (negative disagreement) received significantly more inpatient and outpatient healthcare services compared with those who were sick but thought they were well (positive disagreement; e.g. diabetes: 91% and 75%, respectively; Table 20) in the last 3 years. This could contribute to unnecessary increasing the healthcare expenditure on services. Unnecessary visits comprise about 32% of emergency department visits in the United States (Honigman, Wiler, Rooks, & Ginde, 2013). A Japanese study showed that unnecessary visits to health institutions increased the health insurance expenditures by 20–30% in 2003 (Kohro et al., 2008). At this point it is not known what proportion of these unnecessary visits are associated with negative disagreement between objective and self-reported measures. Further research is needed to find ways to reduce the expenditure in the sector on unnecessary visits.

People who had chronic diseases and understood their diagnosis (positive agreement) received more healthcare services in the same period compared with those who accurately believed they were healthy (negative disagreement; e.g. 67% for inpatients and 100% for outpatient chronic lung disease services; Tables 21–22). This positive agreement for people who had received the services implies that there is a high level of accessibility and equity in health services in Oman. We also found that the outpatient healthcare services were more accessible for patients with chronic diseases than inpatient healthcare services were (Tables 21–22).

We also found that people who were sick with chronic disease and were aware of their illness and people believed they were ill even when they were not (negative disagreement) were more likely to receive family support and health services compared with those who had good health and felt well (negative agreement) and those who felt in well but had disease (negative disagreement), respectively. Furthermore, they were also were more likely to be satisfied with health service responsiveness, quality of life, household income and household expenditure. A study showed that people who had chronic diseases or sick behaviour reported more satisfaction with health services than other respondents did, compared to people who had an absence of diseases (Caverley, Cunningham, & MacGregor, 2007).

5.3 Strengths and Limitations of the Study

A strength of the current study is that it is the first to investigate the implications of the disagreement between self-reporting and objective measures for health service quality and health status in Oman, and one of the few worldwide. This is an area particularly neglected in the current literature that deserves more attention. Another strength is that we used data collected under the supervision of the World Health Organisation and Oman Ministry of Health. Therefore, it was collected using standard measures, such as using global questionnaires. Moreover, the sample size ($N = 3524$) used in this study was representative of the population and provide us with sufficient statistical power to identify existing significant associations.

Some limitations of the current study also need to be considered. First, the validity of variables of health service quality and health status were employed in this survey, and these have been found to be affected by many factors, such as education and income (Kim et al., 2013). Second, the OWHO survey was cross-sectional, which limited our ability to assess the implications of disagreement between self-reported and objective measures for chronic diseases concerning other predictors of quality of life. Finally, the information for some objective measures, such as glucose, was not taken for all participants. Finally, there was a data integrity problem, which it was sent in more than a file without a unique variable.

5.4 Conclusions and Recommendations

Omani adults aged 20 years and older appeared to experience low to moderate agreement between self-reported and objective measures for chronic diseases in 2008, $\varkappa = 0.001$–0.402). There was no effect of some major socioeconomic demographic characteristics, such as education level and economic status, on the agreement of the measurement tools, except for age, sex and region, for both diabetes and hypertension. In addition, the disagreement of the measurement tools had no implications on indicators of health service quality and health status, such as family support and health system responsiveness, household income and household expenditure, while it had significant implications on quality of life and health service utilisation. People who believed they were ill even when they were not (negative disagreement) also receive health services, which may contribute to increasing the expenditures on healthcare services for chronic diseases. These results suggest that physicians should more clearly inform patients of their diagnoses and use defined chronic disease practice guidelines. The implications on health services use and planning of this disagreement in the diagnosis of chronic diseases have been scarcely addressed in the literature, therefore, the results from our study need to be taken as a first approximation to this issue. Provided the unexpected results, we recommend examining closely the integrity of the dataset before giving full value about the validity of them.

Finally, for future research on the accuracy of self-reporting of diseases and objective measures, the complete objective measures should be more carefully considered. The implications on health services use and planning of this disagreement in the diagnosis of chronic diseases have been scarcely addressed in the literature, therefore, the results from our study need to be taken as a first approximation to this issue. Provided with these unexpected results, we recommend examining closely the integrity of the dataset before giving full value about the validity of them.

Competing Interests Statement

The authors declare that there are no competing or potential conflicts of interest.

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