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Validation of the Persian work productivity and activity impairment questionnaire in asthmatic patients

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ABSTRACT

Background: The work productivity and activity impairment (WPAI) questionnaire is a fine linguistic validated tool to measure work productivity and activity impairment. Considering its capability, this study aimed to evaluate the validity of the Persian version of WPAI-AQ in asthmatics.

Methods: The standard forward-backward process was used to translate the English version of WPAI-AQ into Persian. The convergent validity and responsiveness were evaluated by analyzing the correlations between the Persian WPAI-AQ and the health outcomes, and its longitudinal change score with the change in SGRQ score, respectively. Additionally, the stability was estimated according to test-retest scores.

Results: There was a significant correlation between the Persian WPAI-AQ related outcomes and symptoms, activities, and impacts of disease (r = 0.41–0.89, p < 0.04). Desirable stability was observed by the test-retest analysis; 0.90 (95%CI: 0.89–0.95) for overall impairment, 0.90 (95%CI: 0.86–0.93) for work time missed, 0.72 (95%CI: 0.54–0.83) for activity impairment; 0.79 (95%CI: 0.71–0.86) for student class time missed, and 0.76 (95%CI: 0.66–0.81) for school impairment. Response to the change scores strongly supported the longitudinal responsiveness of the Persian WPAI-AQ (r = 0.37 to 0.63, p < 0.05).

Conclusion: The Persian WPAI-AQ is a feasible valid tool to estimate work productivity and activity impairment in Persian-speaking asthmatic patients.

1. Introduction

Asthma, a non-communicable disease, for a long time, has been considered a global health issue affecting more than 300 million people worldwide, and it is estimated that 100 million new cases will be added to this population by 2025 [1,2]. As stated by the GDB 2016 report, in spite of the decreasing rate of asthma mortality due to using inhaled corticosteroids, the disability-adjusted life years (DALYs), less effective productivity at work and school and healthcare use are unavoidable [2]. Therefore, asthma carries considerable economic costs, including the direct cost in terms of medical treatment, medication, hospitalization, as well as indirect cost in general terms non-medical expenditure such as transportation, work/school productivity impairments and absence from work or school due to disablement [3].

Commonly, economic burden estimation is necessary to construct wise therapy [4]. Several investigations of the asthma economic burden have been accomplished in various high-income countries; however, the data from low-income and middle-income countries are only limited to direct healthcare costs [5–7]. Furthermore, there is not an integral authoritative tool for accounting that in these countries [8]. The WPAI

(Work Productivity and Activity Impairment) questionnaire is the most validated, the convenient and practical self-reported instrument to measure indirect cost, generally related to work impairment, which can be adjusted to special diseases [9–11]. Many specific versions of the WPAI have been used to measure lost productivity in numerous diseases. Recently, the validated WPAI-asthma questionnaire (WPAI-AQ) of the English language version has been utilized [12]. However, a reliable tool to estimate asthma economic burden among Iranian people is absent. In this regard, the main aim of this study is to validate the Persian version of the WPAI-AQ to construct a country-specific version according to the local lifestyle.

2. Methods

2.1. Study population

By employing convenience sampling, six hundred and six outpatients from lung and pulmonary disease clinics have participated in this study that were diagnosed to have asthma on the base of ATS/ERS guidelines in the normal clinical setting by respiratory physicians. Additionally, fifty-eight patients

were randomly recruited for the reliability assessment of the final instrument. The included participants were 3 to <18 years old (as children) or ≥18 years old (as adults). The informed consent was already obtained from each subject in this Persian WPAI-AQ research study. Adult patients were asked to complete the questionnaire themselves and in the case of children, their parents were asked to fill the questionnaire. The participants who were not able to understand or complete the questions were excluded.

2.2. Translation

The translation of the English WPAI-AQ was followed by the standard methodology (forward-backward procedure) as used by previous studies [13]. Accordingly, the original WAPI-AQ was translated by two bilingual experts who were familiar with the purpose of the questionnaire and had completed the mastery of Persian and English languages [14]. Then, the provisional questionnaire was surveyed by two other experts who were uninformed about the aim of the questionnaire. Afterward, the revised Persian questionnaire was translated into English to be unified with the original one. Finally, the preliminary form of the Persian instrument was prepared.

2.3. Validation of the questionnaire and analyses

2.3.1. Face and content validity
For the qualitative face validity assessment, the questionnaire was tested by ninety asthmatic selected outpatients, who responded to the questions. Therefore, the difficulty, effectiveness, clarity, vagueness, and time-feasibility of the questionnaire were evaluated. In addition, eleven respiratory physicians and one economist that had a longtime clinical background thoroughly reviewed and compared the tool to its English version that was ready for validity assessment. Therefore, they completed the face and content validity form, which was prepared for all items of the questionnaire that displayed the level of importance, difficulty, degree of disparity, transparency, simplicity, and necessity, and offered various comments and wording suggestions. Afterward, all the comments and explanations were discussed by two researchers, and after

consensus achievement, the final instrument was ready for validity.

The quantitative face validity was assessed using impact scores representing the importance of each item of the questionnaire in the form of a 5-point Likert scale: not important (score 1), slightly important (score 2), relatively important (score 3), greatly important (score 4) and absolutely important (score 5), which the score greater than 1.5 was acceptable. The Content validity of the questionnaire was assessed both qualitatively and quantitatively by the same expert panel as mentioned above. Quantitatively, each expert was asked to rate each item on its relevance, clarity, and simplicity using a 4-point Likert scale to measure each item-level clarity (I-CVI), the content validity index (CVI) and the necessity scoring for calculation of the content validity ratio (CVR). Values of 0.75–1.00 for total CVI and 0.64–1.00 for CVR were considered good [15].

2.3.2. Convergent validity
For alternative validation, a questionnaire was required to consider various factors affecting the life-quality of the respiratory patients. We hypothesized that the activity, work and school productivity measured by WPAI-AQ were directly correlated with the health-related quality of life. Therefore, the convergent validity of WPAI-AQ was established by correlating the WPAI-AQ scores with the St. George's scores, the Persian version of St. George's Respiratory Questionnaire (SGRQ) as an appropriate questionnaire [16]. The Spearman's rank correlation was used.

The SGRQ is comprised of 76 items regarding symptoms, activity, impacts, and total score. Symptom score is concerned with 4 recent weeks of respiratory problems, the activity score is related to the assessment of daily physical activity disturbance, the impact score checks out the whole range of disturbances that patients encounter in their life due to respiratory problems, and finally, the total scores sums all of the former constituents. The SGRQ score ranges from 0–100 in which a higher score indicates the worse health-related quality of life and the worst impairment [17,18]. In this line, the Persian WPAI-AQ scoring was calculated as follows:

- Overall work impairment" was calculated as (Percent work time missed) + [(Percent work time attended) * (Percent impairment while at work)]
- Overall school impairment" was calculated in a parallel manner.
- Activity impairment was scored directly based on reported impairment, since there is no 'time missed' component.
- Logically, values for each domain range from 0 to 100%, with higher scores indicating greater impairment.

2.3.3. Reliability
The reliability of the WPAI-AQ was measured with the most common way, the test-retest to measure the long-time stability of the instrument. Fifty-eight patients, who were randomly selected, answered the Persian WPAI-AQ two times. Therefore, the questionnaire was administered twice the score during the 4 weeks. The patients were considered stable when the

severity score did not change, and both the investigator and the patient agreed that the patient's clinical condition was stable. Values above 0.7 were considered good. The intra-class correlation coefficient (ICC) was calculated for the retest reliability and classified as follows: excellent (>0.80), substantial (>0.60–≤0.80), moderate (>0.40–≤0.60), and poor (≤0.40) [19].

2.3.4. Responsiveness

Additionally, the Spearman's rank correlations were used to test the association between the change in WPAI-AQ score and the change in SGRQ score during the 4 weeks of the study period.

2.4. Questionnaire

The final Persian version of the WPAI-AQ consisted of three divisions. The first one includes demographic variables (including age, sex, smoking status, and insurance status), the second part consists of the grades, and lifetime of asthma symptoms. Furthermore, the last section is allocated to WPAI-AQ questions as indirect cost estimations representing economic burden. The subdivisions covered three domains with ten items related to the changes in the quality of life during the past week, indicating work ability, class attendance, work or school cessation, work or school activity impairment.

3. Results

For the initial assessment of the questionnaire, ninety asthmatic patients were conducted to check the quality of the face validity of the instrument for clarity, simplicity, vagueness, and time-feasibility. Considering both tools items and response categories, no unclear problems were observed. However, minor revisions were made based on some recommendations. According to the face validity of 87% of the participants, there was no inconsistency or difficulty in any items or words to understand.

3.1. Participants

At baseline, 606 asthmatic patients, including 190 employees and 37 students, were enrolled to evaluate the instrument reliability and responsiveness that their characteristic data are shown in Table 1. It is worth pointing out that the parents of asthmatic children participated in this study. Sixty-four percent of the patients reported at least one or three concomitant conditions, including allergic rhinitis, sinusitis, nasal polyps, and gastro-esophageal reflux. Table 1 shows the patients' asthma grades according to ATS/ERS classification [20].

3.2. Face and content validity

Impact scores of the questionnaire evaluation displayed admirable results of quantitative face validity as 3.56–5.00.

For content validity, eleven of the fifteen experts, including respiratory specialists and epidemiologists, assessed the tools. They rated the content validity of the Persian WPAI-AQ. Thirty-

Table 1. Demographic and clinical characteristic of participant patients.

Variable	employment subjects (n=190)	Children (n=37)
Age (yr.), Mean(SD)	46.67 (16.34)	9.72(3.80)
Sex	81.1	63.9
Male (%)		
Smoking (%)	9.2	-
Active	4.9	
Passive	52.7	
Non-smoke	33.2	
Cessation		
Working Status (%)	19.4	-
Labor	48.9	
Self-Employment	31.7	
Employee		
Asthma Duration Mean(SD)	7.64 (11.04)	4.05 (2.93)
Asthma Classification (%)	48	-40.0
Intermittent	8	40.0
Mild Persistent	27	20.0
Moderate Persistent	17	
Severe Persistent		
Asthma Family History (%)	37.8	60.6

four of 37 items (91%) exhibited considerable content validity, as 0.75–1.00 for total CVI and 0.64–1.00 for CVR. According to the expert panel, the Q-10 had low clarity and simplicity (I-CVI: 0.68) and Q-22 had low clarity (I-CVI: 0.68). Therefore, some word revisions were made. Although the Q-12 and Q-23 had acceptable content validity (Q-12, I-CVI: 0.8, CVR: 1.00; Q-23: I-CVI, 0.8 CVR: 0.8, respectively), as stated in the expert panel, they had low clarity. Thus, the clinical symptoms were edited with levels of asthma control in Q-12, and some adjusted words were added for better comprehension in Q-23.

As Table 2 presents, 37% of them were accounted for work impairment and 35% described school impairment. Furthermore, 85% of the students missed class time. Moreover, overall work impairment, school impairment, and activity impairment were significant: 55%, 35%, and 95%, respectively (Table 2).

3.3. Convergent validity

Table 3 shows the Spearman's correlation of WPAI outcomes and the quality of life measurement at the baseline. Correlations were between 0.36 and 0.89 that were generally considered as moderate and strong [21]. Each domain of WPAI was significantly correlated with health status outcomes (i.e. symptom, activity, and especially impact score). As this table presents, a higher score shows a significant positive correlation ($p < 0.001$). In this line, the correlation between work or class time missed, overall work or school impairment, and symptom, activity, and impact of health status were strong (Table 3).

3.4. Test–retest reliability

The intra-class correlation coefficient for work time missing was 0.90 (95% CI: 0.86–0.93). Corresponding values were 0.84 (95% CI 0.76–0.91) for impairment while at work, 0.90 (95% CI 0.89–0.95) for overall work impairment, 0.79 (95% CI: 0.71–-0.86) class time missing, 0.76 (95% CI 0.66–0.81) for impairment while at school, 0.77 (95% CI 0.70–0.85) for overall school

Table 2. WPAI outcomes (work, school, and activity impairment) among subjects at baseline.

Variables	n	Mean (SD)	Median (Q1 to Q3)
Subjects currently employed		190	
Percentage of work time missed	105	7.73 (20.15)	0.00 (0.00 to 7.28)
Percentage of work time missed (those with missed time>0)	35	23.20 (29.51)	12.50 (6.67 to 14.29)
Percentage of impairment while at work	186	34.89 (33.47)	30.0 (0.00 to 60.0)
Percentage of impairment while at work (those with % impairment while working>0)	116	55.94 (24.77)	50.0 (40.0 to 77.5)
Percentage of overall work impairment	104	32.44 (37.80)	17.14 (0.00 to 60.0)
Subjects attending classes		37	
Percentage of class time missed	33	50.00 (100.00)	0.00 (0.00 to 100)
Percentage of class time missed (those with missed time>0)	14	85.09 (85.43)	62.50 (17.78 to 120)
Percentage if impairment while at school	13	34.62 (46.66)	0.00 (0.00 to 100)
Percentage of impairment while at work (those with % impairment while at school>0)	13	34.62 (46.66)	0.00 (0.00 to 100)
Percentage of overall school impairment	8	64.83 (67.57)	51.00 (4.17 to 100.00)
All subjects	606		
Percentage of activity impairment due to health problems	578	37.04 (31.61)	30.00 (0.00 to 60)
Percentage of activity impairment due to health problems (those with % activity impairment >0)	430	49.79 (26.61)	40.00 (30.00 to 70.00)

Table 3. Spearman correlations between WPAI outcomes and health status outcomes at baseline.

Items	Symptom (P_v)	Activity (P_v)	Impacts (P_v)	SG total score (P_v)
Percentage of missed work time	0.41 (0.04)	0.61 (0.02)	0.79 (<0.001)	0.62 (0.02)
Percentage of Impairment while working	0.62 (0.03)	0.63 (0.02)	0.73 (0.001)	0.66 (0.01)
Percentage of impairment overall work	0.59 (0.03)	0.63 (0.02)	0.75 (0.001)	0.64 (0.02)
Percentage of missed Class time	0.36 (0.04)	0.59 (0.03)	0.89 (<0.001)	0.55 (0.03)
Percentage of Impairment while at school	0.47 (0.04)	0.51 (0.04)	0.87 (<0.001)	0.56 (0.03)
Percentage of overall school impairment	0.49 (0.04)	0.56 (0.03)	0.88 (<0.001)	0.56 (0.03)
Percentage of Activity impairment while activity	0.77 (<0.001)	0.77 (<0.001)	0.81 (<0.001)	0.79 (<0.001)

Table 4. Spearman Correlations between change in WPAI and change in the quality of life outcomes*.

Item	symptom	Activity	impacts	SG total score
Percent overall work impairment	0.42 (0.37–0.46)	0.54(0.46–0.58)	0.63 (0.52–0.67)	0.50 (0.41–0.54)
Percent overall school impairment	0.37 (0.23–0.49)	0.48(0.45–0.51)	0.61 (0.59–0.67)	0.46 (0.43–0.49)
Percent activity impairment while activity	0.58 (0.55–0.61)	0.57 (0.54–0.61)	0.62 (0.58–0.66)	0.58 (0.55–0.61)

*Values represent Spearman correlation (95% CI); all significant at p < 0.05.

impairment, and 0.72 (95% CI 0.54–0.83) for regular activity impairment.

3.5. Responsiveness

As it is indicated in Table 4, the significant correlation was found in each change of the quality of life domains, including the work, school, and activity impairment scores of the Persian WPAI-AQ compared to SGRQ at baseline and 4 weeks follow up (p < 0.05).

4. Discussion

Asthma with detrimental outcomes influencing socio-economic elements such as general quality of life and work productivity has been a major concern for a long time. Therefore, multipurpose validated instruments, including AQOL, SF-36, SGRQ, and WPAI-AQ have been used to measure them [12,22–24]. In this line, WPAI-AQ, which has been quantitatively utilized to measure the impact of the disease on a loss of productivity, is a linguistic validated tool. This is the

first study that quantitatively confirmed the Persian version of the WPAI-AQ instrument validity and reliability. At the baseline, the construct validity of WPAI-AQ exhibited a significant correlation of presenteeism and absenteeism percentage scores with health status, including symptoms, activity, and impact of the disease. The findings display that the Persian WPAI-AQ validity is similar to previous reports from the questionnaire validation developed in some diseases [25,26]. It is interesting that absenteeism and presenteeism outcomes are strongly correlated with the impact of the disease than the total SGRQ scores as a reference questionnaire. It is proposed that the WPAI-AQ domains are appropriately fit with a health scale. In children, missing class time and overall school impairment are correlated with the impact of the disease, which may be related to parenting social attribute and their sensitivity to children's health that affected their absenteeism than presenteeism and activities [26,27]. To evaluate prolonging WPAI-AQ proficiency, this study assessed its responsiveness to changes in the productivity outcome concerning quality of life. Although it was exhibited that there is a significant correlation between productivity impairment and quality of life in retest

assessment, partially remission was found to the baseline, which may be imputed to treatment effectiveness result in decreased levels of impairment.

Some limitations were related to original WPAI questionnaire, which were displayed previously, such as the lack of indirect cost evaluations of the unemployed population, assessments of personal satisfaction levels within major career classes, and demotion or loss of a job; these limitations were encountered in this study [10]. Furthermore, concerning the multi-social structures of the country, its validation was carried out in determining the geographical area. Finally, the limited patients were enrolled for the questionnaire validation. The convenience sampling was used for participant selection; however, it seems that for the methodology of the current type of studies, random sampling could be a better approach.

It is pointed out that WPAI-AQ is an appropriate and wide-ranging tool to evaluate the burden of asthmatic employed patients by measuring the impairment in their work and activity rather than tools relying on simple symptom scores or generic health status as it were used in previous disease-specific validated questionnaires [11,28]. In addition, former WPAI-AQ studies entirely emphasized on impairment assessment in work and daily activities; however, the Persian WPAI-AQ considered a generic measurement of the health status.

5. Conclusions

In summary, content and convergent validity, re-test reliability, as well as responsiveness to clinical meaningful changes confirms that the Persian WPAI-AQ is the preferable practical instrument quantitatively providing the impact of asthma on productivity outcomes in clinical practice.

Author contributions

All authors contributed to the study conception and design. E Seyedrezazadeh, K Ansarin and M Najmi were involved in the conceptualization, design and methodology of study; E Seyedrezazadeh conducted the questionnaire preparation; A Sharifi, K Ansarin and AH Jafari Rouhi participated in patient selection; E Seyedrezazadeh and N Gilani performed data analysis and interpretation; Y Aftabi, M Khalili assisted in manuscript edition; E Seyedrezazadeh developed the drafted and finalized the manuscript; each listed author approved the final version submitted for publication.

Declaration of interest

The authors have no relevant affiliations or financial involvement with any organization or entity with a financial interest in or financial conflict with the subject matter or materials discussed in the manuscript. This includes employment, consultancies, honoraria, stock ownership or options, expert testimony, grants or patents received or pending, or royalties.

Ethics approval

This study was funded by the Non-communicable Center of the Ministry of Health and Medical Education (No. 530000-87), Tuberculosis and Lung Disease Center, and Tabriz University of Medical Sciences and conducted with the Ethics Committee approval number IR.TBZMED.REC.1397.801 of Tabriz University of Medical Sciences.

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