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Research Article

A validation study of the Taiwanese version of the assessment of spondyoarthritis international society health index

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Objective: The objective is to validate the Assessment of SpondyloArthritis International Society Health Index (ASAS HI) in patients with Spondyloarthritis (SpA).

Methods: We recruited 102 consecutive patients with SpA from two rheumatology clinics. Demographic data was collected. Recruited patients completed the ASAS HI and other self-assessment questionnaires (Bath Ankylosing Spondylitis Disease Activity Index (BASDAI), Bath Ankylosing Spondylitis Global Index (BASGI), Oswestry Disability Index (ODI), Short Form (36) Health Survey (SF-36), Euro-quality-of-life-5D (EQ5D), Hospital Anxiety and Depression Scale (HADS) and Work Productivity and Activity Impairment questionnaire (WPAI)). Ankylosing Spondylitis Disease Activity Score (ASDAS) was calculated. Correlations between ASAS HI and the questionnaires were determined for concurrent validity. The ASAS HI score was also checked for test-retest reliability, internal consistency, discriminative ability, and floor and ceiling effects.

Results: The ASAS HI achieved good test-retest reliability (ICC 0.87), internal consistency, and discriminative ability. It had no floor or ceiling effect. Favourable concurrent validity was found with measures of disease activities (BASDAI, ASDAS), quality-of-life (SF 36, EQ5D), psychological symptoms (HADS), and work disability (WAPI). The ASAS HI was able to differentiate higher disease activity and psychological symptoms. Patients found it easy to understand, comprehensive, relevant and appropriate to their disease. The average time needed to complete the questionnaire was 2 minutes 36 seconds ± 1 minute 2 seconds.

Conclusion: The Taiwanese version of the ASAS HI is a validated tool in the assessment of health status in patients with SpA.

Keywords: spondyloarthritis • quality of life • patient attitude to health • depression • disability evaluation

Introduction

Spondyloarthritis (SpA) describes a spectrum of diseases characterized by axial joint inflammation and enthesitis. Other associated features include uveitis, peripheral arthritis, dactylitis, psoriasis, and inflammatory bowel disease. It is categorized as axial spondyloarthritis (axSpA) or peripheral spondyloarthritis (pSpA) [1,2]. AxSpA may be further classified into Ankylosing Spondylitis (AS) [3] and non-radiographic axial spondyloarthritis (nr-axSpA). SpA is a chronic disease affecting a predominantly younger age group, resulting in significant functional disability [4], poorer quality of life [4,5], anxiety and depression [6], and work disability [4].

The International Classification of Functioning, Disability and Health (ICF) published by the World Health Organisation (WHO) is a classification of health domains used in individuals with a wide range of diseases [7]. The ASAS Health Index (ASAS HI) was developed by the Assessment of Spondyloarthritis international Society (ASAS) as a measurement tool specific for patients with SpA. It contains 17 dichotomous items addressing the ICF categories of pain, emotional functions, sleep, sexual functions, mobility, self-care, community life and employment. The ASAS HI is believed to be more specific than other comparable assessment tools in measuring functioning and disability in patients with SpA [8]. It has been translated into 19 languages [9] including traditional Chinese, which is the character set primarily used in Hong Kong as well as in Taiwan. Our goal is to evaluate

the usefulness of ASAS HI in the ethnic Chinese in Hong Kong.

Methods

One hundred and two patients were consecutively recruited from two rheumatology clinics in Queen Mary Hospital, Hong Kong, from May to November 2017. All fulfilled either the ASAS classification criteria for axial SpA [1] or the ASAS classification criteria for peripheral SpA [2]. All were ethnic Chinese living in Hong Kong, greater than 18 years of age, and have signed a written consent. Patients with major organic illness (e.g. stroke or malignancy) or illiteracy were excluded. Demographic and disease-associated data was collected. This included age, sex, current and past smoking and alcohol use, education level, family history of SpA, history of uveitis and enthesitis, history of inflammatory bowel disease and psoriasis, duration of back pain, and duration of peripheral arthritis. Physical examination was performed to determine the 68-tender joint count, 66-swollen joint count and Bath Ankylosing Spondylitis Metrology Index (BASMI) [10] for spinal mobility. Blood parameters including C-Reactive Protein (CRP), Erythrocyte Sedimentation Rate (ESR) and Human Leucocyte Antigen (HLA) B27 were recorded. Antero-posterior view of lumbosacral (LS) spine radiographs were performed. A rheumatologist (HYC) blinded to clinical data graded the radiographs for sacroiliitis according to the Modified New York (MNY) criteria [3] for Ankylosing Spondylitis (AS). Radiological sacroiliitis were graded as: 0, normal; 1 doubtful; 2, obvious; 3, partial fusion; 4, complete fusion. Bilateral sacroiliitis grade 2 or above, or unilateral sacroiliitis grade 3 or above was defined as radiological AS.

Disease classification

All recruited patients with SpA were classified into axial SpA group or peripheral SpA group according to the ASAS classification criteria. In the axial SpA group, patients would also be classified into AS if they had radiological sacroiliitis.

Ethics approval

This study was approved by the Institutional Review Board of the University of Hong Kong and Hospital Authority Hong Kong West Cluster (Institutional review board number UW 17-201). It was conducted in accordance with the Declaration of Helsinki and the guidance of Good Clinical Practice, November 30, 2006.

ASAS HI

Patients completed the Taiwanese version of ASAS HI [11], which was chosen for its use of traditional Chinese, the character set predominantly used in Hong Kong. This version was translated by ASAS. The ASAS HI score was determined by summing up the 17 dichotomous items. Retesting was done one week apart to determine reproducibility and reliability of the instrument.

Concurrent validity and self-assessment questionnaires

Patients were asked to complete a package of self-assessment questionnaires, to which the ASAS HI was compared for concurrent validity. These included the Bath Ankylosing Spondylitis Disease Activity Index (BASDAI) [12], Bath Ankylosing Spondylitis Global Index (BASGI) [13], and Ankylosing Spondylitis Disease Activity Score CRP or ESR base (ASDAS -CRP or ASDAS-ESR) [14,15] for disease activity, Numerical Rating Score (NRS) for back pain, Bath Ankylosing Spondyloarthritis Functional Index (BASFI) [16] for functional status, BASMI for spinal mobility, Euro-Quality-of-life-5D (EQ5D) [17] for quality of life, Oswestry Disability Index (ODI) [18,19] for quality of life and disability, Short Form (36) Health Survey (SF-36) [20,21] for physical and psychological health, Work Productivity and Activity Impairment questionnaire (WPAI) [22] for work productivity and regular activities, and Hospital Anxiety and Depression Scale (HADS) for anxiety and depressive symptoms [6,23]. The ASAS HI was compared with these questionnaires for degree of correlation. They were also compared with the tender and swollen joint count in peripheral arthritis.

Field test

All patients who completed the ASAS HI were included in a field test in the form of a face-to-face interview with a rheumatologist and a member of the research team. The time required to complete the questionnaire was recorded. Patients were inquired about their comprehension of the written instructions, general opinions of the questionnaire and comments on specific items.

Sample size

The calculated minimal number of respondents was 85, based on exploratory factor analysis requirement of 5 respondents per item in the questionnaire [24], and a total of 17 items on the ASAS HI. Therefore, the sample size of 102 in this study is adequate.

Statistical analyses

Demographic data was reported with mean ± Standard Deviation (SD). Differences between measures were compared using t-test for continuous variables and chi-squared test for categorial variables. Floor and ceiling effect was defined as the lowest and highest possible scores at least 15% of the studied patients achieved [24]. Cronbach's alpha was used to test the internal consistency of the measurements. A value >0.7 was defined as adequate [25]. Test-retest reliability was measured by Intra-Class Correlation (ICC). A value of >0.7 indicate good reproducibility [24]. Spearman's correlation was used to analyse the construct validity between ASAS HI and various health outcomes. These include: tender and swollen joint count, back pain score, BASDAI, BASFI, BASGI, ASDAS, BASMI, EQ5D, ODI, SF36, WPAI, and HADS. Discriminant ability of ASAS HI was assessed between groups with different health statuses. The health status was classified according to 1) disease activity index using ASDAS-CRP, ASDAS-ESR, and BASDAI. 2) Anxiety and depressive symptoms using HADS anxiety (HADS-A), and HADS score respectively. The ASDAS-CRP and ASDAS-ESR were categorized into 4 groups: inactive disease (<1.3), moderate disease activity (1.3 to <2.1), high disease activity (2.1 to <3.5), and very high disease activity (≥ 3.5). The BASDAI was categorized into 2 groups: low disease activity (<4), and high disease activity (≥4). The HADS-A score was categorized into 2 groups: no anxiety symptoms (<7), and anxiety symptoms (≥7) [6]. The HADS total score was categorized into 2 groups: no depressive symptoms (<8), and depressive symptoms (≥8) [6].

In all statistical analyses, a p-value of less than 0.05 was considered significant. All statistical analyses were performed using Statistical Product and Service Solutions (SPSS) package 21.0.

Results

The 102 recruited patients had a mean age of 45.8 ± 14.7 years. There were 58 male patients and 44 female patients. Fifteen (14.7%) patients were current or past smokers and 14 (14.2%) had current or past alcohol use. Seventy-four (72.5%) fulfilled ASAS classification criteria for axial SpA, 28 (27.5%) fulfilled ASAS classification criteria for peripheral SpA and 40 (39.2%) fulfilled MNY criteria (radiological AS). All patients in the radiological AS group also fulfilled the ASAS classification criteria for axial SpA. Our cohort was characterised by long disease duration (back pain duration 14.4 ± 11.6, peripheral arthritis duration 8.7 ± 9.4), mild to moderate disease activity (BASDAI 3.3 ± 1.9; ASDAS-CRP 1.25 ± 0.85; ASDAS-ESR 2.30 ± 0.95), and mild functional impairment (BASFI 2.0 ± 2.2). Details of demographic characteristics are shown in Table 1.

Cronbach's alpha, floor and ceiling effects

The studied instruments are described in Table 2. The Cronbach's alpha of ASAS HI was 0.76. There was no significant floor or ceiling effect. This was in contrast to SF 36 in which significant ceiling effects were observed in the sub-scores of role physical (23.5%), role emotional (36.3%), and social functioning (37.6%). ASDAS is a composite scale and no reliability test was performed.

Construct validity and test-retest reliability

Construct validity of ASAS HI with other instrumental tools are shown in Table 3. Statistically significant correlations were found between ASAS HI and back pain, BASDAI, BASFI, BASGI, ASDAS-CRP, ASDAS-ESR, BASMI, ODI in SpA, nr-axSpA, pSpA, and AS groups. Only tender joint count in pSpA correlated with ASAS HI. The score was also found to correlate negatively with EQ5D and SF 36 scores, and positively with WPAI (apart from work time missed) and HADS scores in different SpA subgroups. Test-retest reliability is shown in Table 4. Favourable reproducibility was observed in all SpA subgroups.

Field test

Average time required to complete ASAS HI was 2 minutes 36 seconds ± 1 minute 2 seconds. The ASAS HI was found to be easy to understand, comprehensive, relevant and appropriate to their disease as shown in Table 5.

Discriminant abilities of ASAS HI

The discriminant abilities of ASAS HI are shown in Table 6. The ASAS HI had the ability

Table 1. Demographics and clinical characteristics.				
	All SpA patients (n=102)	**Fulfilled ASAS criteria for axial SpA (n=74)**	**Fulfilled ASAS criteria for peripheral SpA (n=28)**	**Fulfilled MNY criteria for AS (n=40)**
Age (years)	45.8 ± 14.7	44.4 ± 14.6	49.7 ± 14.5	47.7 ± 15.0
Male sex	58/102 (56.9%)	43/74 (58.1%)	15/28 (53.6%)	30/40 (75.0%)
Current or past smoker	15/102 (14.7%)	14/74 (19.0%)	1/28 (3.6%)	10/40 (25%)
Current or past alcohol use	14/99 (14.2%)	12/72 (16.6%)	2/27 (7.1%)	9/38 (23.7%)
Education level: nil	0/101 (0.0%)	0/74 (0.0%)	0/27 (0.0%)	0/40 (0.0%)
Education level: Primary	8/101 (7.9%)	5/74 (6.8%)	3/27 (11.1%)	1/40 (2.5%)
Education level: secondary	42/101 (41.6%)	32/74 (43.2%)	10/27 (37.0%)	21/40 (52.5%)
Education level: Tertiary or above	51/101 (50.5%)	37/74 (50.0%)	14/27 (51.9%)	18/40 (45.0%)
Duration of back pain (years)	14.4 ± 11.6	15.0 ± 12.1	--	18.1 ± 14.4
Duration of peripheral arthritis (years)	8.7 ± 9.4	7.3 ± 8.5	11.3 ± 10.8	10.4 ± 8.4
Tender joint count	0.3 ± 0.7	0.3 ± 0.7	0.4 ± 0.8	0.2 ± 0.7
Swollen joint count	0.1 ± 0.4	0.1 ± 0.4	0.1 ± 0.4	0.1 ± 0.5
Family history of SpA	23/97 (22.5%)	21/71 (29.6%)	2/26 (7.7%)	11/37 (29.7%)
History of uveitis	28/101 (27.5%)	24/74 (32.4%)	4/27 (14.8%)	17/40 (42.5%)
History of enthesitis	34/101 (33.3%)	22/73 (30.1%)	12/28 (42.9%)	10/39 (25.6%)
History of IBD	4/99 (4.0%)	3/74 (4.1%)	1/26 (3.8%)	1/40 (2.5%)
History of psoriasis	24/102 (23.5%)	9/72 (12.2%)	15/28 (53.6%)	3/40 (7.5%)
SpA: spondyloarthritis; n: number of patients; ASAS: Assessment of Spondyloarthritis international Society; MNY: Modified New York; AS: Ankylosing Spondylitis; IBD: inflammatory bowel disease				

Table 2. Description of measurements.						
	Mean ± SD	**Observed range**	**Theoretical range**	**Cronbach's Alpha**	**Floor %(number)**	**Ceiling %(number)**
ASAS HI (n=102)	5.98 ± 3.97	0.00, 17.00	0.00, 17.00	0.76	3.9% (4)	2.0% (2)
BASDAI (n=102)	3.3 ± 1.9	0.4. 7.5	0.0, 10.0	0.86	2.0% (2)	0.0% (0)
BASFI (n=101)	2.0 ± 2.2	0.0, 8.9	0.0, 10.0	0.95	22.8% (23)	0.0% (0)
ASDAS-CRP (n=97)	1.3 ± 0.9	0.0, 3.5	NA	NA	5.2% (5)	0.0% (0)
ASDAS-ESR (n=99)	2.3 ± 1.0	0.5, 5.7	NA	NA	1.0% (1)	0.0% (0)
EQ5D-5L score (n=102)	0.789 ± 0.177	0.312, 1.000	-0.391, 1.000	0.82	1.0% (1)	7.8% (8)
HADS score						
HADS anxiety (n=102)	5.6 ± 3.7	0.0, 16.0	0.0, 21.0	0.87	9.8% (10)	0.0% (0)
HADS depression (n=102)	4.7 ± 4.0	0.0, 19.0	0.0, 21.0	0.87	10.8% (11)	0.0% (0)
HADS total (n=102)	10.3 ± 7.2	0.0, 35.0	0.0, 42.0	0.92	7.8% (8)	0.0% (0)
SF-36						
Physical functioning (n=101)	74.3 ± 21.6	5.00, 100.00	0.00, 100.00	0.9	1.0% (1)	9.9% (10)
Role physical (n=102)	71.75 ± 24.21	0.00, 100.00	0.00, 100.00	0.94	1.0% (1)	23.5% (24)
Role emotional (n=102)	75.25 ± 26.02	0.00, 100.00	0.00, 100.00	0.95	2.9% (3)	36.3% (37)
Vitality (n=101)	53.55 ± 20.26	0.00, 93.75	0.00, 100.00	0.81	1.0% (1)	0.0% (0)
Emotional well-being (n=101)	68.02 ± 18.71	20.00, 100.00	0.00, 100.00	0.82	1.0% (1)	3.0% (3)
Social functioning (n=101)	78.22 ± 22.89	12.50, 100.00	0.00, 100.00	0.81	1.0% (1)	37.6% (38)
Bodily pain (n=101)	62.80 ± 23.19	10.00, 100.00	0.00, 100.00	0.84	1.0% (1)	8.9% (9)
General health (n=96)	43.28 ± 20.14	0.00, 80.00	0.00, 100.00	0.8	2.1% (2)	0.0% (0)
WPAI						
WPAI work time missed % (n=66)	0.57 ± 2.57	0.00, 17.00	0.00, 100.00	--	--	--

WPAI impairment while working % (n=67)	19.71 ± 21.89	0.00, 90.00	0.00, 100.00	--	--	--
WPAI overall work impairment % (n=69)	0.56 ± 2.53	0.00, 17.00	0.00, 100.00	--	--	--
WPAI activity impairment % (n=100)	23.70 ± 24.23	0.00, 100.00	0.00, 100.00	--	--	--

ASAS HI: Assessment of Ankylosing Spondylitis international society health index; n: number of patients; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; BASFI: Bath Ankylosing Spondylitis Functional Index; ASDAS: Ankylosing Spondylitis Disease Activity Score; CRP: C-reactive protein; ESR: erythrocyte sedimentation rate; EQ5D: Euro-quality-of-life-5D; HADS: Hospital Anxiety and Depression Scale; SF-36: Short Form (36) Health Survey; WPAI: Work Productivity and Activity Impairment questionnaire

Table 3. Construct validity of ASAS HI with SpA disease activity indices, EQ5D, SF36, WPAI and HADS scores.

	All SpA patients (n=102)		**Fulfilled ASAS criteria for axial SpA (n=74)**		**Fulfilled ASAS criteria for peripheral SpA (n=28)**		**Fulfilled MNY criteria for AS (n=40)**	
	cc	p-value	CC	p-value	CC	p-value	CC	p-value
Tender joint count	0.16	0.11	0.04	0.71	0.42	0.03	-0.03	0.835
Swollen joint count	0.07	0.51	0.08	0.518	0.08	0.7	0.08	0.619
Back pain NRS	0.42	<0.001	0.35	0.002	--	--	0.43	0.01
BASDAI	0.6	<0.001	0.54	<0.001	0.7	<0.001	0.65	<0.001
BASFI	0.63	<0.001	0.57	<0.001	0.77	<0.001	0.61	<0.001
BASGI	0.67	<0.001	0.62	<0.001	0.76	<0.001	0.69	<0.001
ASDAS-CRP	0.55	<0.001	0.53	<0.001	0.54	0.004	0.61	<0.001
ASDAS-ESR	0.48	<0.001	0.46	<0.001	0.51	0.01	0.55	<0.001
EQ5D	-0.67	<0.001	-0.59	<0.001	-0.84	<0.001	-0.63	<0.001
ODI	0.64	<0.001	0.53	<0.001	0.84	<0.001	0.5	0.001
SF 36								
SF 36 physical functioning	-0.63	<0.001	-0.54	<0.001	-0.79	<0.001	-0.53	<0.001
SF 36 Role Physical	-0.61	<0.001	-0.52	<0.001	-0.81	<0.001	-0.61	<0.001
SF36 Role emotional	-0.64	<0.001	-0.55	<0.001	-0.83	<0.001	-0.59	<0.001
SF 36 vitality	-0.6	<0.001	-0.57	<0.001	-0.66	<0.001	-0.69	<0.001
SF 36 emotional well being	-0.55	<0.001	-0.49	<0.001	-0.71	<0.001	-0.5	0.001
SF 36 social functioning	-0.68	<0.001	-0.62	<0.001	-0.84	<0.001	-0.64	<0.001
SF 36 bodily pain	-0.55	<0.001	-0.45	<0.001	-0.74	<0.001	-0.48	0.002
SF 36 general health	-0.55	<0.001	-0.5	<0.001	-0.64	<0.001	-0.51	0.001
WPAI								
WPAI work time missed %	0.08	0.54	0.05	0.75	0.18	0.482	0.05	0.83
WPAI impairment while working %	0.59	<0.001	0.57	<0.001	0.63	0.004	0.66	<0.001
WPAI overall work impairment %	0.63	<0.001	0.61	<0.001	0.68	0.002	0.65	<0.001
WPAI activity impairment %	0.54	<0.001	0.46	<0.001	0.76	<0.001	0.48	0.002
HADS								
HADS anxiety score	0.53	<0.001	0.56	<0.001	0.47	0.01	0.59	<0.001
HADS depression score	0.58	<0.001	0.54	<0.001	0.65	<0.001	0.58	<0.001
HADS total score	0.59	<0.001	0.58	<0.001	0.62	<0.001	0.6	<0.001

SpA: spondyloarthritis; n: number of patients; ASAS: Assessment of Spondyloarthritis international Society; MNY: Modified New York; AS: Ankylosing Spondylitis; cc: correlation coefficient; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; BASFI: Bath Ankylosing Spondylitis Functional Index; BASGI: Bath Ankylosing Spondylitis Global Index; BASMI: Bath Ankylosing Spondylitis Metrology Index; ASDAS: Ankylosing Spondylitis Disease Activity Score; CRP:C-reactive protein; ESR: Erythrocyte Sedimentation Rate; EQ5D: Euro-quality-of-life-5D; ODI: Oswestry Disability Index; HADS: Hospital Anxiety and Depression Scale; SF-36: Short Form (36) Health Survey; WPAI: Work Productivity and Activity Impairment questionnaire

Table 4. Test-retest reliability.

ASAS HI	All SpA patients (n=102)	Fulfilled ASAS criteria for axial SpA	Fulfilled ASAS criteria for peripheral SpA (n=28)	Ankylosing spondylitis (n=40)
Mean ± SD, 1st measurement	6.0 ± 4.0	6.3 ± 3.8	5.1 ± 4.4	6.7 ± 4.3
Mean ± SD, 2nd measurement	5.7 ± 4.5	6.0 ± 4.4	4.9 ± 4.8	6.3 ± 5.2
ICC (95% CI)	0.87 (0.80; 0.91)	0.81 (0.70; 0.88)	0.96 (0.90; 0.98)	0.80 (0.62; 0.90)
p-value	<0.001	<0.001	<0.001	<0.001

SpA=spondyloarthritis; n=number of patients; ASAS=Assessment of Spondyloarthritis international Society; MNY=Modified New York; AS=Ankylosing Spondylitis; cc=correlation coefficient; SD=Standard Deviation; ICC= Intra-Class Correlation; CI=Confidence Interval

Table 5. Field test results.

ASAS HI	Agree	Disagree
Consider the questionnaire easy to understand ?	100/102 (98.0%)	2/102 (2.0%)
Consider any item to be ambiguous ?	1/102 (1.0%)	901/102 (99.0%)
Feel that the questionnaire is easy to complete ?	100/102 (98.0%)	2/102 (2.0%)
Feel that the questionnaire is comprehensive to assess health in patients with SpA?	101/102 (99.0%)	1/102 (1.0%)
Feel that issues are missing ?	6/102 (5.9%)	96/102 (94.1%)
Consider any items inappropriate (culturally)?	5/102 (4.9%)	97/102 (95.1%)
Feel that most of the items were highly relevant to him/her ?	101/102 (99.0%)	1/102 (1.0%)
Consider the instructions to be appropriate ?	101/102 (99.0%)	1/102 (1.0%)

SpA: spondyloarthritis

Table 6. Discriminant abilities of ASAS HI by disease activity and psychological status.

Disease activity					
ASDAS-CRP	Inactive ≤1.30	Low 1.31-2.09	High 2.10-3.49	Very high>3.50	p-value
ASAS-HI	4.16 ± 3.06	7.05 ± 3.35	10.02 ± 4.34	NA	<0.001
BASDAI	1.91 ± 0.89	4.01 ± 1.09	6.24 ± 0.91	NA	<0.001
ASDAS-ESR	Inactive <1.3	Low 1.3-2.1	High 2.1-3.5	Very high>3.5	
ASAS-HI	2.74 ± 2.39	4.79 ± 3.56	6.90 ± 3.72	9.21 ± 4.14	<0.001
BASDAI	1.10 ± 0.78	2.16 ± 1.01	4.06 ± 1.60	5.95 ± 0.97	<0.001
BASDAI	Low		High		
ASAS-HI	4.60 ± 3.28		8.62 ± 3.88		<0.001
ASDAS-CRP	0.80 ± 0.55		2.13 ± 0.60		<0.001
ASDAS-ESR	1.84 ± 0.62		3.20 ± 0.83		<0.001
Psychological status					
HADS-A	No anxiety symptom (<7.0)		Anxiety symptoms (<7.0)		p-value
ASAS-HI	4.73 ± 3.55		7.85 ± 3.87		<0.001
SF-36 emotional well-being	77.92 ± 14.30		53.54 ± 14.54		<0.001
HADS-total	No depressive symptom (<8.0)		Depressive symptoms (^{3}8.0)		
ASAS-HI	3.76 ± 3.21		7.41 ± 3.77		<0.001
SF-36 emotional well-being	81.67 ± 13.15		59.44 ± 16.50		<0.001

ASAS: Assessment of Spondyloarthritis international Society; BASDAI: Bath Ankylosing Spondylitis Disease Activity Index; ASDAS: Ankylosing Spondylitis Disease Activity Score; CRP: C-Reactive Protein; ESR: Erythrocyte Sedimentation Rate; HADS: Hospital Anxiety and Depression Scale; HADS-A: Hospital Anxiety and Depression Scale, anxiety subscale; SF-36: Short Form (36) Health Survey

to discriminate inactive (<1.3), low (1.3 to <2.1), and high disease activities (2.1 to <3.5) according to ASDAS-CRP (ASAS HI 4.16 ± 3.06 vs. 7.05 ± 3.35 vs. 10.02 ± 4.34, p<0.001); inactive (<1.3), low (1.3 to <2.1), high (2.1 to <3.5), and very high disease activities (≥ 3.5) according to ASDAS-ESR (ASAS HI 2.74 ± 2.39 vs. 4.79 ± 3.56 vs. 6.90 ± 3.72 vs. 9.21 ± 4.14, p<0.001); low (<4), and high disease activities (≥ 4) according to BASDAI (ASAS HI 4.60 ± 3.28 vs. 8.62 ± 3.88, p<0.001); no anxiety symptoms (<7), and anxiety symptoms (≥ 7) according to HADS-A score (ASAS HI 4.73 ± 3.55 vs. 7.85 ± 3.87, p<0.001); and no depressive symptoms (<8), and depressive symptoms (≥ 8) according to HADS total score (ASAS HI 3.76 ± 3.21 vs. 7.41 ± 3.77, p<0.001).

Discussion

The World Health Organization in 1984 defined health as "a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity" [26]. Comprehensive assessment of patients with SpA involves assessment of health status in addition to the routine assessment of disease activity and damage. The ASAS HI was developed as a specific tool for assessing functioning and general health status in patients with SpA. In this study, we show that the traditional Chinese translation in the Taiwanese version of ASAS HI is useful in Hong Kong Chinese patients with SpA, including in the subgroups of axSpA, pSpA, and AS.

The ASAS HI correlated with disease activity in this study. The index had the ability to differentiate different measures of disease activities as represented by BASDAI and ASDAS. However, tender and swollen joint counts per se were found to have no correlation with ASAS HI. This may be due to the relatively low average numbers of tender joint counts (0.3) and swollen joint counts (0.1) in our cohort, which is comparable to results reported in other international studies [27,28]. Hence, the lower occurrence of peripheral arthritis results in minimal impact on health status.

Good correlations were found between ASAS HI and BASMI, BASGI, BASFI, ODI, SF 36, WPAI, and HADS scores. Higher scores in the ASAS HI differentiated out those with elevated depressive and anxiety symptoms, as determined by the HADS total score and HADS-A score respectively according to cut-off values validated and recommended in a previous local study [6]. The ASAS HI had the ability to detect both general and specific disease patterns.

The internal consistency was adequate. Test-retest reliability showed good reproducibility. The results were compatible with the original and other international validation studies [9,29-31] There was no floor or ceiling effect. This is in contrast to SF 36 where significant ceiling effects were observed in role physical, role emotional, and social functioning. The ASAS HI is an assessment tool specific to patients with SpA while the SF 36 is a general survey of health status. The former has a more detailed assessment of relevant areas in SpA and is therefore, more suitable in disease assessment [32].

WPAI parameters including impairment while working, overall work impairment, and activity impairment were correlated with ASAS HI. However, no such correlation was found with percent work time missed. This unexpected finding may be unique to the city's industrious work culture, as Hong Kong residents tend to work despite illness. Hong Kong was ranked as the hardest working city in the world in 2015. The total number of hours of work per year per person was 2606 [33]. The ASAS HI was user friendly. The average time for completion of the questionnaire was 2.5 minutes, which is acceptable even in a busy clinic setting in Hong Kong. The patients found the questions culturally appropriate and instructions easy to understand.

Limitation

Although the sample size in our study was adequate, the number of patients involved in the subgroups may be inadequate. Further studies with larger sample size would be useful for better validation.

Conclusion

The Taiwanese version of ASAS HI was found to be a reliable and valid tool in assessing overall health status in patients with SpA. It was found to be associated with disease activity, quality of life, psychological symptoms, and work disabilities. It is user-friendly and easy to complete.

Conflict of interest

The authors declare no conflict of interest.

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