ORIGINAL ARTICLE

Validation of the Persian version of the dysphagia in multiple sclerosis questionnaire for the assessment of dysphagia in multiple sclerosis

Faezeh Asadollahpour, Azar Mehri, Ahmadreza Khatoonabadi, Fereshteh Mohammadzaheri, Abbas Ebadi[1]
Department of Speech Therapy, School of Rehabilitation,Tehran University of Medical Sciences, [1]Behavioral Sciences Research Center, Nursing Faculty, Baqiyatallah University of Medical Sciences, Tehran, Iran

Background: This study is to evaluate swallowing problems (dysphasia) in multiple sclerosis (MS) patients; the importance of using tools that are durable and appropriate is well understood. One of the most trusted tools is the dysphagia in multiple sclerosis (DYMUS) test. The aim of this study was to prepare a Persian version and to evaluate the validity and reliability of the test. **Materials and Methods**: This methodological study was conducted on 236 MS patients in Southeast of Iran from August 2015 to February 2016. After translation and cultural adaptation of the test in Persian, the validity of this test was determined using expert opinions accordance with the International Quality of Life Assessment Project. In addition, exploratory factor analysis (EFA) was performed with varimax rotation. The confirmatory factor analysis (CFA) was conducted and the goodness of fit indices was calculated. Moreover, to test the reliability, Cronbach's alpha coefficient and intraclass correlation coefficient (ICC) were used. **Results:** In total, 236 MS patients were included in the study (81 males and 155 females). All the questions in the test's Persian version obtained an acceptable face and content validity (content validity ratio = 1, Scale content validity index/Ave = 1). EFA revealed that the scale has two factors (solid–liquid) with 67.5% cumulative variance. CFA indicated a good fit to the intended two-factor structure, and the ratio of Chi-square to the degree of freedom was 1.79, and the root mean square error of approximation was 0.058. The internal consistency of total test indicated the appropriate level (Cronbach's alpha coefficient = 0.775), and test–retest reliability total questionnaire was found to be ICC = 0.985, indicating its high reliability. **Conclusion:** The results of this study indicated that the Persian version of the DYMUS questionnaire had good reliability and validity for patients with MS.

Key words: Dysphagia, multiple sclerosis, questionnaire, reliability, validity

How to cite this article: Asadollahpour F, Mehri A, Khatoonabadi A, Mohammadzaheri F, Ebadi A. Validation of the Persian version of the dysphagia in multiple sclerosis questionnaire for the assessment of dysphagia in multiple sclerosis. J Res Med Sci 2019;24:52.

INTRODUCTION

Multiple sclerosis (MS) is a chronic, progressive, and demyelinating disease of the central nervous system that affects sensory and motor functions.[1] The disease affects approximately 1 in 1000 people, and its prevalence is observed in 1.1 million people in the world.[2,3] Among Asian countries, Iran is placed second with respect to the incidence of MS.[1,4-6] This disease is characterized in 85%–90% of patients, with recurrence and symptom-relief cycles, suggesting that these symptoms of deterioration and relapse are the clinical reflections of inflammation in the central nervous system.[7] MS is one of the most important diseases that afflicts an individual's life as it usually affects the best course of one's life and gradually leads him/her to disability.[8-10] MS typically has its onset in early adulthood and produces a range of unpleasant and disabling symptoms such as cognitive dysfunction and swallowing disorder.[11,12] Swallowing disorder is a mental awareness of severe swallowing through the passage of a solid piece or liquid from the mouth to the stomach.[13,14] Swallowing disorder, in MS patients, is associated with a range of potential causes, such as corticobulbar impairment, cerebellum and

Access this article online

Quick Response Code:

Website: www.jmsjournal.net

DOI: 10.4103/jrms.JRMS_248_18

Address for correspondence: Dr. Azar Mehri, Department of Speech Therapy, School of Rehabilitation, Tehran University of Medical Sciences, Pich-e-Shemiran, Enghelab Avenue, Tehran 1148965141, Iran. E-mail: mehri@tums.ac.ir
Received: 18-04-2018; **Revised:** 10-09-2018; **Accepted:** 10-03-2019

brainstem inactivity, cranial nerves palsies, and cognitive impairment.[15-17] Swallowing disorder is seen in more than a third of MS patients. A study by Poorjavad *et al*. concluded that 31.7% of MS patients had some problems in swallowing.[18,19]

Swallowing problems increase the chances of dehydration and pneumonia aspiration, malnutrition and inability to use the drug, and consequently reduce the quality of life of these patients.[20-22] These side effects often lead to disability and death at the end stages of MS.[23] However, the side effects listed above can be avoided by a rapid screening protocol that can provide early and appropriate detection, which reduces the risk of swallowing problems in these patients.[14,24] Therefore, the diagnosis of swallowing disorder in the early stages is an important factor in reducing these complications. However, the patients usually underestimate these symptoms; it is difficult to identify this problem.[25] In this regard, there are different diagnostic methods, such as videofluoroscopy and electromyography, which are partly invasive tests.[26] In 2010, Bergamaschi *et al*. (with a group of Italian neurologists and MS-field experts) developed dysphagia in multiple sclerosis (DYMUS) questionnaire and validated it in MS patients to identify the risk of dysphagia in this population and is considered as a user-friendly and noninvasive method.[27,28] In this questionnaire, there are ten questions (yes or no questions), seven of which aim to examine swallowing disorder with solids, and three of them pertain to swallowing disorder with liquids.[28] This questionnaire is a useful tool for identifying oropharyngeal dysphagia, and the important features of these disorders in MS patients and also be used to identify patients in need of more instrumental evaluation and planning programs for the prevention of aspiration.[29] The DYMUS questionnaire is considered valid, reliable, and efficient tool for MS patients to identify the risk of dysphagia, thus a number of countries has applied this questionnaire after translating into their own language and then, applying it in a different setting to check the validity and reliability of it in the new context. In Persian, Jafari prepared Persian version of this questionnaire and determined its validity and reliability in Tehran.[30] Simultaneously, we performed this research in Southeast of Iran in different setting and context with permission from Bergamaschi (2010). As per the information mentioned previously, a valid and reliable tool for measuring swallowing disorder in different setting and context is necessary.

For this purpose, the researchers have tried to investigate the validity and reliability of the questionnaire for assessing swallowing disorder in MS patients (DYMUS) in Southeast of Iran.

MATERIALS AND METHODS

Subjects

A total of 81 males and 155 females participated in the study, and the mean age of participants was 37.49 (standard deviation [SD] = 10.66) and 35.2 (SD = 10.96) years, respectively. To be included in the sample, a patient must have been diagnosed with MS according to McDonald's criteria, and patient's general condition must have been stable. Furthermore, they could not have any cognitive limitation and another neurologic disease that could lead to difficulty in swallowing. The selected patients received information about the study and written informed consent was obtained from the patients before the study started. They were assured that their names would not be mentioned during any part of the study and they would not be paid for participating in the research, and they were free to leave the test any time they wanted to. The study was approved by Ethical Committee of Zahedan University of Medical Sciences and permission was obtained from the authors who had developed the original English version.

Persian version of dysphagia in multiple sclerosis

DYMUS includes ten questions, in which the patient can assign two responses for each question (No, Yes), adding a value to each response (No = 0, Yes = 1), and reaching a score ranging from 0 to 10. The DYMUS has seven questions in the solid subscale and three questions in liquid subscale. The present research is a methodological study that was conducted on 236 MS patients in Southeast of Iran to prepare a Persian version of DYMUS and its validity and reliability. The guideline for the cross-cultural adaptation was considered in accordance with the International Quality of Life Assessment Project (IQOLA) (Gandek, 1998). The method of the project included the stages of test translation, validity checking, reliability checking, and information analysis.

First step – translation of the DYMUS questionnaire: After preparing the test using articles and getting its author's permission for translating it into the Persian language, the translation stage was started. At this stage, the original English version was translated into Persian in accordance with the IQOLA translation and equivalent protocol.

For this purpose, first two translators, whose native language was Farsi and who had sufficient experience and proficiency in translating English texts and translated the test's English version. Moreover, the two interpreters were also asked to provide a list of possible alternative translations, if necessary, for some of the words, phrases, and sentences contained in the test. At this stage, emphasis was placed on the conceptual adaptation of the words, phrases, and sentences contained in the test.

Each translator then scored every single word, phrase, and sentence in the test, in terms of translating difficulty based on a 100-point visual scale. In this visual scale, every item with 0 score was considered quite easy to translate, and those with 100 were considered extremely difficult to translate. It should be noted that due to the differences in the difficulty of translating at this stage, the average difficulty score below 25 was considered as an easy translation, the average difficulty score between 25 and 30 was considered as relatively easy translation, and the average score of difficulty >30 was considered as difficult to translate. The Persian version of DYMUS questionnaire prepared at this stage was given to two other translators. These new translators then rated the quality of translation for every single word, phrase, and sentence in the Persian version of the DYMUS questionnaire.

At this stage, the quality of translation pertained to the appropriateness of phrases and sentences in terms of clarity (using simple and understandable words), the use of common language (avoiding the use of technical, specialized, and artificial words), being conceptually identical (understanding the conceptual content of the original scale), and the overall quality of the translation. For each instruction, responses and recommendations in this visual scale, 0 represented a completely inappropriate quality and 100 meant a perfectly appropriate and satisfactory quality. The decision criterion for the undesirable quality of translations was the average quality score (as determined by the translators) of below 90. Some of the commands, responses, and suggestions in the Persian version of DYMUS questionnaire may have been inappropriate at this stage according to this criterion. In the next stage, during a meeting of the translators and the researchers of the study, we discussed the obtained scores. Finally, for the cases of difficult and undesirable translations, the suggested alternative words and phrases were examined. At the last stage of the translation process, two other translators, both of them were fluent in both English and Persian, were asked to translate the Persian version to English again. Then, the English versions obtained by the two translators were discussed in a number of meetings with the researchers. Finally, a joint English translation was agreed on. Subsequently, the English version prepared at this stage was compared with the original English version of the test in terms of the same concept, so as to be identical during various meetings with the researchers and send back-translated version to the original author. After completing the above steps, a Farsi version of DYMUS questionnaire was prepared with a satisfactory translation quality.

Second stage – validity of the DYMUS questionnaire: first, the determination of the test validity included determining the face and content validity and this was done by speech and language pathologists. To determine the face validity of the Persian version of DYMUS questionnaire, a form was prepared to examine its (DYMUS) questions by eight speech, and language pathologists in terms of 1 – fluency, transparency, and comprehensibility and 2 – relevance to the cultural conditions of our society (Qualitative method). Furthermore, a scale of 6 was used, and a question was accepted if 80% of the participants had scored >4 for that particular question (quantitative method). The content validity of the test was also determined by eight speech and language pathologists, and the Lawshe's content validity ratio (CVR) based on the three-level scale: "essential," "useful, but not essential," or "not necessary." The acceptable content validity coefficient varies according to the number of experts who determine the content validity. Moreover, the minimum acceptable content validity coefficient based on Lawshe's method according to the eight experts were 75%.[9]

Construct validity

The construct validity of the questionnaire conducted using exploratory factor analysis (EFA) and confirmatory factor analysis (CFA). The factor structure of the questionnaire was extracted using EFA. EFA was performed with varimax rotation. It was hypothesized that two factors would be obtained with eigenvalues >1. CFA offers a variety of statistical tests and indices designed to assess the "goodness of fit" of identified models.[31] In the present study, to examine the goodness of fit, the ratio of Chi-square to the degree of freedom was calculated and is good if it is <3 and <5 is acceptable. Next, the model fitness was studied by goodness of fit indices that included: the nonnormed fit index, the comparative fit index (CFI), and the root mean square error of approximation (RMSEA), normed fit index (NFI), incremental fit index (IFI), relative fit index (RFI), and Parsimony NFI (PNFI).

These indexes indicate whether the hypothesized model was a good fit to the observed data.

At this stage, 236 patients who had gone to hospitals and MS clinics in Southeast of Iran were selected by the nonrandom sampling method from the available population. The samples' information was collected by using the documents and medical records of the patients in the hospitals and clinics, and their eligibility for participation in the research was determined on the basis of the inclusion and exclusion criteria. In this way, the patients included in the study had MS but had no severe MS attacks during the month prior to the study. To be included in the study, the patients' dysphagia and the absence of MS attacks during a month before the study must first have been approved by a neurologist. The

patients who had answered the questionnaire incompletely were excluded from the research.

A quiet place without distracting agents was selected in the hospitals and clinics, and the questionnaire was performed individually on each sample. During the test, the examiner was present at the site to answer the probable questions from the patients. The time required to respond to the questionnaire was 15–20 min per person.

Third stage-reliability test: In order to evaluate the reliability of the Persian version of DYMUS, used from internal consistency with the Cronbach's alpha coefficient (Cronbach's alphas of 0.70–0.80 are considered satisfactory) and for repetitions used test–retest with the intraclass correlation coefficient (ICC < 0.40 = poor reliability; ICC ≥ 0.40 but ICC ≤ 0.75 = fair to good reliability; and ICC > 0.75 = excellent reliability). The patients completed the questionnaire again 1 month later and retest were performed with 36 patients who had volunteered for the second application to assess the stability over time in the next month.

Data analysis

The data analysis was performed by the SPSS 16.0 (SPSS Inc., Version 16.0. Chicago, IL, USA). Moreover, LISREL statistical software, version 8.8. In addition to descriptive statistics (including number-percentage, mean, SD), according to IQOLA project to assess the psychometric properties of Persian version of DYMUS, several tests were performed.

RESULTS

The purpose of this study was to examine psychometric properties of the Persian version of DYMUS questionnaire and performed on 236 patients with MS (81 males and 155 females). The mean age of the participants was 37.49 (SD = 10.66) and 35.2(SD = 10.96) years, and the mean age of education was 10.2 (SD = 3.1) and 6.2(SD = 4.4) years, respectively**.** Characteristics of the patients are shown in Table 1. In the preliminary examination phase of the test, in the difficulty evaluation section from the viewpoint of the translators, the average score assigned to the difficulty of translation for each item was below 25, and therefore, the translation was considered as an easy translation. In the translation quality assurance section, the mean score given to four aspects of quality was ≥90, and the overall quality of the translation was approved. All the questions in the test's Persian version obtained an acceptable content validity coefficient, which indicated that all the questions had content validity index (content validity ratio = 1, Scale content validity index/Ave = 1).

Table 1: Demographic characteristics of participants in the study

Gender	*n* (%)	Age (mean±SD)
Male	81 (34.3)	37.49±10.66
Female	155 (65.7)	35.2±10.96

SD=Standard deviation

For construct validity, the EFA was used. Factor analysis involves gathering a high number of variables under a small number of headings.[31] The factors with a value >1 were included in our research, which is known as the Kaiser–Guttman rule. To assess the appropriateness of the sample size (236 people), the Kaiser–Meyer–Olkin (KMO) test and Bartlett's test of sphericity were used. The result of the KMO test was 0.86, which was at the desired and satisfactory level, and the result of Bartlett's test of sphericity was also statistically significant (df = 45, $P < 0.001$, Chi-square = 1367.65). To determine the number of factors, an eigenvalue >1 was used. The results showed that this scale has two factors that explained 67.5% of the total variance. The factors that formed the scale included two parts of solids (7 items) and liquids (3 items). Table 2 shows the factor variance of the items in each section. CFA was carried out, and the validity of the questionnaire was confirmed [Table 3]. The ratio of Chi-square to the degree of freedom is good if it is <3 and <5 is acceptable.[31] In the present study, the Chi-square was 61.16 and the degree of freedom was 34 and the ratio of Chi-square to the degree of freedom was 1.79 indicating the perfect fit of Persian version of the scale. Other fitness indices including, RMSEA, IFI, NFI, CFI, RFI, and PNFI indicated the suitable fitness or optimal fit of this scale [Table 3].

Reliability

The Cronbach's alpha coefficient of the factors was determined to be as follows: solid domain: $\alpha = 0.901$ and liquid domain: $\alpha = 0.807$. The Cronbach's alpha coefficient of the total scale was 0.775. The total questionnaire's repetitions were found to be ICC = 0.985, indicating its high reliability [Table 4].

DISCUSSION

The first step in planning to interfere with swallowing disorder in any society is to identify the disorder and examine its prevalence, which should be done in each community individually.[32] The DYMUS questionnaire is a reliable and useful tool that is easy to use to assess the warning signs of swallowing disorder in MS patients. The DYMUS questionnaire has been translated into Portuguese,[33] French,[29] Turkish,[34] and they have reported its validity and reliability. However, we did not find any published Persian version of DYMUS.[30] To use these measuring tools in different populations, it must first be

Table 2: Factor analysis of items in each component of the questionnaire (rotated component matrix)

n	Item	Component	
		Factor 1: Dysphagia for solids	Factor 2: Dysphagia for liquids
1	Difficulty swallowing solids	0.898	
2	Difficulty swallowing liquids		0.905
3	Globus sensation	0.866	
4	Food sticking	0.854	
5	Coughing after ingestion of solids	0.912	
6	Coughing after ingestion of liquids		0.868
7	Needs several swallowing actions to swallow solids	0.768	
8	Cuts food small pieces to swallow	0.757	
9	Takes many sips to drink		0.757
10	Weight loss	0.479	
	Percentage of variance	45.3	22.2
	Cumulative variance %	67.5	

Table 3: Goodness of fit indices of confirmatory factor analysis

Fit indices	Estimated values	Standard values
Chi-square	61.16	
Degrees of freedom	34	
RMSEA	0.058	Good <0.08 moderate 0.08-0.1 Week >0.1
NFI	0.97	>0.9
IFI	0.99	>0.9
CFI	0.99	>0.9
RFI	0.96	>0.9
PNFI	0.73	>0.5

RMSEA=Root mean square error of approximation; NFI=Normed fit index; IFI=Incremental fit index; CFI=Comparative fit index; RFI=Relative fit index; PNFI=Parsimony normed fit index

Table 4: Test-retest reliability of Persian version of dysphagia in multiple sclerosis

Factor	Question number	Mean (SD)	Cronbach's α	ICC	CI (95%)
Solids	1, 3, 4, 5, 7, 8, 10	1.8 (2.4)	0.901	0.98	0.97-099
Liquids	2, 6, 9	0.8 (1.1)	0.807	0.99	0.98-0.99
Total		2.63 (2.5)	0.775	0.985	0.97-0.99

ICC=Intraclass correlation coefficient; SD=Standard deviation; CI=Confidence interval

tested on the target population for validity and reliability. Therefore, the Persian version of DYMUS was prepared in accordance with the Persian language and cultural standards in Southeast of Iran to enable therapists to assess the risk of swallowing disorder in MS patients. Hence, the purpose of this study was to provide a Persian version of DYMUS, evaluate its validity and reliability, and adapt it according to the Persian culture and language. In this study, the face and content validity of the Persian version of the questionnaire was assessed, and their validity was found to be acceptable.

The factor analysis showed that the questionnaire was composed of two factors of solids (Cronbach's alpha coefficients = 0.901) and liquids (Cronbach's alpha coefficients = 0.807), and these factors were in accordance with the original DYMUS questionnaire (solids [Cronbach's alpha coefficients = 0.885] and liquids [Cronbach's alpha coefficients = 0.864]), the Turkish version (solids [Cronbach's alpha coefficients = 0.650] and liquids [Cronbach's alpha coefficients = 0.670]), and the Portuguese version (solids [Cronbach's alpha coefficients = 0.670] and liquids [Cronbach's alpha coefficients = 0.673]).

In addition, the results of the present study indicated that the Persian version of the DYMUS questionnaire had a high internal consistency (Cronbach's alpha coefficients = 0.775) similar to Jafari's study (Cronbach's alpha coefficients = 0.725).[30] This finding was similar to the results of the original DYMUS study by Bergamaschi *et al*. (Cronbach's alpha = 0.88, 0.91), the Portuguese version (Cronbach's alpha = 0.72), and the Turkish version (solids [Cronbach's alpha = 0.91]). The Persian version of the DYMUS questionnaire obtained a high test–retest consistency (ICC = 0.899, confidence interval = 0.845–0.941, $P < 0.001$) like to Jafari's study (ICC = 0.880–0.956),[30] which is similar to the Turkish version of the questionnaire; but this consistency is not expressed in the original and the Portuguese versions. In the Persian version of the DYMUS questionnaire, question number 10 (Weight loss) had a low correlation with the other questions, which is similar to the Bergamaschi *et al*. and the Portuguese versions. Question 10 was related to weight loss, and usually, weight loss was only seen in the advanced stages of dysphagia – a neurological disease similar to MS, and so the patients reported lower scores for Question 10.

In the present study, the CFA was used to evaluate the goodness of fit of the two factor model of DYMUS proposed by Bergamaschi *et al*. The fit indices indicated a good fit of the data to the model (Chi-Square = 61.16, $P = 0.0029$). This finding was similar to the results of the Jafari's study ($\chi^2 = 52.88$, $P = 0.020$; $\chi^2/df = 1.55$). It was found that a two-factor model fit the data well and all standardized factor loadings were significant.

In general, the information obtained from the current research shows that the Persian version of the DYMUS questionnaire is a valid and reliable tool for identifying swallowing disorder in Persian MS patients. Using the Persian version of this questionnaire, speech and language pathologists, who work with dysphagia, will have a better chance to identify swallowing disorder in the early stages and thereby provide the necessary interventions.

The apparent limitation with the DYMUS questionnaire is that uneducated people, who cannot read, cannot use it. Therefore, it is suggested that another version that can be used orally should be provided to enable uneducated patients to use it.

CONCLUSION

The results of this study indicate that Persian version of DYMUS questionnaire is a valid and reliable tool for assessing swallowing disorder in Persian MS patients. Therefore, according to the results of this study, it is suggested that at specified intervals, the Persian version of the DYMUS questionnaire should be used in the related health centers to investigate the presence of swallowing disorder in MS patients to diagnose dysphagia at the early stages and perform the relevant interventions.

Acknowledgments

The authors would like to thank Jale Amiri and Zahra Radpour for their assistance in data collection, and Dr. Mohammadi for her assistance in data analysis.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Ghafari S, Ahmadi F, Nabavi M, Memarian R. Effects of applying progressive muscle relaxation technique on depression, anxiety and stress of multiple sclerosis patients in Iran national MS society. Res Med 2008;32:45-53.
2. Buljevac D, Hop WC, Reedeker W, Janssens AC, van der Meché FG, van Doorn PA, *et al.* Self reported stressful life events and exacerbations in multiple sclerosis: Prospective study. BMJ 2003;327:646.
3. Pugliatti M, Sotgiu S, Rosati G. The worldwide prevalence of multiple sclerosis. Clin Neurol Neurosurg 2002;104:182-91.
4. Moghtaderi A, Rakhshanizadeh F, Shahraki-Ibrahimi S. Incidence and prevalence of multiple sclerosis in Southeastern Iran. Clin Neurol Neurosurg 2013;115:304-8.
5. Etemadifar M, Sajjadi S, Nasr Z, Firoozeei TS, Abtahi SH, Akbari M, *et al.* Epidemiology of multiple sclerosis in Iran: A systematic review. Eur Neurol 2013;70:356-63.
6. Saadatnia M, Etemadifar M, Maghzi AH. Multiple sclerosis in Isfahan, Iran. Int Rev Neurobiol 2007;79:357-75.
7. Mitchell AJ, Benito-León J, González JM, Rivera-Navarro J. Quality of life and its assessment in multiple sclerosis: Integrating physical and psychological components of wellbeing. Lancet Neurol 2005;4:556-66.
8. Vickrey BG, Hays RD, Harooni R, Myers LW, Ellison GW. A health-related quality of life measure for multiple sclerosis. Qual Life Res 1995;4:187-206.
9. Fruehwald S, Loeffler-Stastka H, Eher R, Saletu B, Baumhackl U. Depression and quality of life in multiple sclerosis. Acta Neurol Scand 2001;104:257-61.
10. Nabavi SM, Poorfarzam S, Ghassemi H. Clinical course and prognosis of 203 patients with MS in Shahid Mostafa Khomeini hospital, Tehran 2002. Tehran Univ Med J 2006;64:90-7.
11. Nabavi SM, Sangelaji B. Cognitive dysfunction in multiple sclerosis: Usually forgotten in the clinical assessment of MS patients. J Res Med Sci 2015;20:533-4.
12. Dehnavi SR, Heidarian F, Ashtari F, Shaygannejad V. Psychological well-being in people with multiple sclerosis in an Iranian population. J Res Med Sci 2015;20:535-9.
13. De Pauw A, Dejaeger E, D'hooghe B, Carton H. Dysphagia in multiple sclerosis. Clin Neurol Neurosurg 2002;104:345-51.
14. Prosiegel M, Schelling A, Wagner-Sonntag E. Dysphagia and multiple sclerosis. Int MS J 2004;11:22-31.
15. Calcagno P, Ruoppolo G, Grasso MG, De Vincentiis M, Paolucci S. Dysphagia in multiple sclerosis – Prevalence and prognostic factors. Acta Neurol Scand 2002;105:40-3.
16. Marchese-Ragona R, Restivo D, Marioni G, Ottaviano G, Masiero S, Staffieri A. Evaluation of swallowing disorders in multiple sclerosis. Neurol Sci 2006;27:335-7.
17. Tassorelli C, Bergamaschi R, Buscone S, Bartolo M, Furnari A, Crivelli P, *et al.* Dysphagia in multiple sclerosis: From pathogenesis to diagnosis. Neurol Sci 2008;29 Suppl 4:S360-3.
18. Poorjavad M, Derakhshandeh F, Etemadifar M, Soleymani B. Associated Factors with Swallowing Disorders in Patients with Multiple Sclerosis. Journal of Isfahan Medical School 2010;28:1-7.
19. Poorjavad M, Derakhshandeh F, Etemadifar M, Soleymani B, Minagar A, Maghzi AH, *et al.* Oropharyngeal dysphagia in multiple sclerosis. Mult Scler 2010;16:362-5.
20. Domenech E, Kelly J. Swallowing disorders. Med Clin North Am 1999;83:97-113, ix.
21. Cheak EM. Multiple Sclerosis and Dysphagia: Dissertation Southern Illinois University Carbondale; 2011.
22. Thomas FJ, Wiles CM. Dysphagia and nutritional status in multiple sclerosis. J Neurol 1999;246:677-82.
23. Hadjikoutis S, Wiles CM. Respiratory complications related to bulbar dysfunction in motor neuron disease. Acta Neurol Scand 2001;103:207-13.
24. Merson RM, Rolnick MI. Speech-language pathology and dysphagia in multiple sclerosis. Phys Med Rehabil Clin N Am 1998;9:631-41.
25. Aleyasin H, Sarai A, Alaedini F, Ansarian E, Lotfi J. Multiple sclerosis: A study of 318 Iranian cases. Archives of Iranian Medicine 2002;5:24-7.
26. Restivo DA, Casabona A, Centonze D, Marchese-Ragona R, Maimone D, Pavone A, *et al.* Pharyngeal electrical stimulation for dysphagia associated with multiple sclerosis: A pilot study. Brain Stimul 2013;6:418-23.
27. Bergamaschi R, Crivelli P, Rezzani C, Patti F, Solaro C, Rossi P, *et al.* The DYMUS questionnaire for the assessment of dysphagia in multiple sclerosis. J Neurol Sci 2008;269:49-53.

28. Bergamaschi R, Minguzzi S, Amato MP, Patti F, Bonavita S, Grasso MG, *et al*. Validation of the DYMUS questionnaire for the assessment of dysphagia in multiple sclerosis. Funct Neurol 2009;24:159.
29. Villain M, Heinzlef O. DYMUS questionnaire for dysphagia in multiple sclerosis: French validation and clinical considerations. In Multiple Sclerosis Journal 2013;19:356.
30. Jafari Z. Preparing Persian Version of DYMUS Questionnaire and Determining its Validity and Accepted Manuscript Reliability [Dissertation]. Tehran: Tehran University of Medical Sciences; 2016.
31. Comrey AL, Lee HB. A first course in factor analysis: New York; Psychology Press; 2013.
32. Guan XL, Wang H, Huang HS, Meng L. Prevalence of dysphagia in multiple sclerosis: A systematic review and meta-analysis. Neurological Sciences 2015;36:671-81.
33. Sales DS, Alvarenga RM, Vasconcelos CC, Silva RG, Thuler LC. Translation, cross-cultural adaptation and validation of the Portuguese version of the DYMUS questionnaire for the assessment of dysphagia in multiple sclerosis. SpringerPlus 2013;2:332.
34. Tenekeci EG, Kara B, Çetiz A, Demirkaya Ş, Demir N, Açikel C. Validity and Reliability of the Turkish Version of the Questionnaire for the Assessment of Dysphagia in Multiple Sclerosis. Arch Neuropsych 2016;55:243-7.