ORIGINAL ARTICLE

# Translation and psychometric validation of the Arabic Gestational Diabetes Management Self-Efficacy Scale (GDMSES)

## I. Al Hashmi*, B. Al Yazidi, O. Al Omari

*College of Nursing, Sultan Qaboos University, Al Khoudh 66, Muscat 123, Oman*

**Abstract**
*Introduction:* The assessment of self-efficacy for adherence to healthy behaviours among women with gestational diabetes (GDM) is undermined by the unavailability of validated tools. Therefore, this study aimed at translating, culturally adapting and assessing the psychometric properties of the Arabic version of Gestational Diabetes Management Self-Efficacy Scale (GDMSES).
*Materials and methods:* This methodological study was conducted in the Antenatal Clinic at Sultan Qaboos University Hospital in Oman between October 2016 and January 2017. A total of 90 forms of the Arabic GDMSES tool were completed by Omani pregnant women with gestational diabetes. The study has a multiphase design: (1) cultural and linguistic validation; (2) content and face validity; (3) construct validity; (4) internal validity.
*Results:* The Arabic GDMSES showed satisfactory content validity (CVI between .8 and 1), acceptable overall scale internal consistency reliability (Cronbach's alpha = 0.85) and stability overtime (Pearson correlation coefficient > .6). Four factors emerged for construct validity using exploratory factor analysis: nutrition and body weight, adaptation to healthy eating, physical activity and treatment and blood sugar. Our sample size of 90 was considered adequate in determining these factors (Kaiser–Meyer–Olkin = .78).
*Conclusions:* GDMSES is a valid and reliable tool, thus providing a quick and easy self-efficacy assessment tool for antenatal nurses dealing with pregnant women with GDM.
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* Corresponding author.
 *E-mail addresses:* eiman@squ.edu.om, reemal-shariqa@hotmail.com (I. Al Hashmi).

**Traducción y validación psicométrica de la escala árabe de autoeficacia para el manejo de la diabetes gestacional (GDMSES)**

**Resumen**

*Introducción y objetivos:* La evaluación de la autoeficacia para la adherencia a conductas saludables entre mujeres con diabetes gestacional (DMG) se ve socavada por la falta de disponibilidad de herramientas validadas. Por lo tanto, este estudio tuvo como objetivo traducir, adaptar culturalmente y evaluar las propiedades psicométricas de la versión árabe de la escala de autoeficacia para el manejo de la diabetes gestacional (GDMSES).

*Materiales y métodos:* Este estudio metodológico se llevó a cabo en la Clínica Prenatal del Hospital Universitario Sultan Qaboos en Omán entre octubre de 2016 y enero de 2017. Un total de 90 formularios de la herramienta árabe GDMSES fueron completados por mujeres omaníes embarazadas con diabetes gestacional. El estudio tiene un diseño multifásico: (1) validación cultural y lingüística; (2) contenido y validez aparente; (3) validez de constructo; (4) validez interna.

*Resultados:* El GDMSES árabe mostró una validez de contenido satisfactoria (CVI entre 0,8 y 1), una confiabilidad de consistencia interna de la escala general aceptable (alfa de Cronbach = 0,85) y estabilidad en el tiempo (coeficiente de correlación de Pearson > 0,6). Surgieron cuatro factores para la validez de constructo utilizando un análisis factorial exploratorio: nutrición y peso corporal, adaptación a una alimentación saludable, actividad física y tratamiento y azúcar en sangre. Nuestro tamaño de muestra de 90 se consideró adecuado para determinar estos factores (Kaiser - Meyer - Olkin = 0,78).

*Conclusiones:* GDMSES es una herramienta válida y confiable, por lo que proporciona una herramienta de evaluación de la autoeficacia rápida y fácil para las enfermeras prenatales que tratan con mujeres embarazadas con DMG.

## Introduction

Globally, the prevalence of gestational diabetes mellitus (GDM) is rising, particularly in ethnic groups.[1] GDM has the same physiological process of type 2 diabetes and is characterized by insulin resistance.[2] It complicates 10.5–24.2% of all pregnancies based on the population composition and the diagnostic criteria used.[3] Women with gestational diabetes are at major risk of requiring caesarean section, developing preeclampsia, and giving birth to big babies (birth weight > 4 kg) or babies with shoulder dystocia.[4] In the future, women with a history of GDM are at a high risk to develop type 2 diabetes, and their offspring are more likely to develop obesity and type 1 diabetes mellitus.[5,6] Recent evidence indicates that the care provided to pregnant women with GDM imposes a large burden on the healthcare system for treatment of GDM-related complications. Xu et al. (2017) reported that the care provided to pregnant women with GDM is associated with a 95% increase in the medical expenses as compared to the care provided to pregnant women without GDM, and this increase in medical expenses is divided as the following: 52% increase for neonatal complications, 26% increase for mother's complications, and 22% increase for GDM diagnosis.[7] A more recent evidence by Dall et al. (2019), estimated that the economic burden of GDM (mothers and newborns) reached almost $404 billion in the United States.[8] Similar findings were reported in Italy and Mexico.[9,10]

Self-care behaviours are the cornerstone for GDM management and for the prevention of its complications, given the important role of active participation of the woman on maintaining her blood glucose level at acceptable levels. Daily self-care behaviours that women with GDM need to plan and implement to manage their gestational diabetes include self-monitoring of blood glucose level, taking prescribed medications and lifestyle modifications concerning eating an appropriate diet and exercising regularly.[3] In recognition of GDM being a mostly self-managed condition, the care of pregnant women with GDM should be focused on providing health interventions that support and facilitate the aforementioned behavioural changes. A factor identified to be an important predictor for behavioural changes and successful adherence to healthy behaviours is self-efficacy.[11] Albert Bandura, in his Social Cognitive Theory (SCT), defines self-efficacy as ''the beliefs one holds in one's capabilities to organize and execute the courses of actions required to produce given attainments''.[12] In diabetes research, improved self-efficacy was associated with improved self-care management behaviours, improved blood glucose control, and improved mental health-related quality of life.[13–15] Although self-efficacy has been found to positively affect adherence to the recommended healthy behaviours among type 2 diabetes patients, there is a dearth of studies which investigated the impact of self-efficacy among women with GDM. This may be partly attributed to the fact that there is no tool specifically designed to assess self-efficacy among pregnant

women with gestational diabetes. In fact, the are many tools available to measure self-efficacy of diabetic patients, one of which is widely used is the Diabetes Management Self-Efficacy Scale (DMSES).[16] Therefore, the main purpose of this study is to translate, culturally adapt and assess the psychometric properties of the Arabic version of DMSES among pregnant women with gestational diabetes.

To our knowledge and based on the reviewed literatures, the current study is the first to adapt DMSES among a sample of pregnant women with gestational diabetes. The utilization of the adapted tool would enable researchers in the field of gestational diabetes to conduct future studies in pregnant women with GDM and assess their self-efficacy for adherence to diabetes management plans. Specifically, it will guide in developing strategies to improve pregnant women's self-efficacy, which will subsequently support this population in managing their gestational diabetes and improving pregnancy outcomes.

## Methods

### Study setting

This study was conducted in the Antenatal Clinic at Sultan Qaboos University Hospital (SQUH) in the country of Oman. SQUH is located in the capital city, Muscat. Muscat City is the largest city in Oman, with an estimated total population (in Oman) of 4, 992, 364 in 2019, including Omani and non-Omani citizens.[17] SQUH is one of the leading hospitals in Oman that provides tertiary care, clinical training and health research. Patients attending this hospital consist predominately of Omani citizens from various regions of Oman, which makes this hospital an ideal setting for this study, as its patients represent Omani pregnant women with gestational diabetes. An average of two women with GDM were expected to visit this clinic daily.

### Procedure

DMSES is a tool designed to measure perceived self-efficacy (self-ability) to adhere to healthy behaviours related to the management of type 2 diabetes. The original tool is a 5-point scale with 20 items divided to 4 subscales including nutrition specific and weight, nutrition (general) and medical treatment, exercise and blood glucose. The total score in this tool lies between 0 and 100, with a higher score indicating higher perceived self-efficacy for healthy behaviours.[18] However, the revised version of DMSES includes 20 items with a 10-point scale.[19] The DMSES is a reliable tool with Cronbach's alpha 0.81 and test–retest reliability 0.79.

The translation and validation of the Gestational Diabetes Management Self-Efficacy Scale (GDMSES) were guided by the World Health Organization's Steps of Translation and Adaptation of Instruments.[20] The reliability of the tool was examined following three steps: back translation, testing content validity by an expert panel and pilot testing to determine the scale's internal consistency and stability over time.

In the beginning, and taking into account the study purpose, the nature of the management plan of gestational diabetes and Omani culture, the study's principle investigator (a nursing faculty specialized in gestational diabetes) reviewed the original DMSES and edited the items accordingly. Four items on medical treatment (item 7, 9, 19, & 20) that are not applicable to all pregnant women with gestational diabetes were excluded, and the remaining 16 items were the scope of this study translation and validation. Minor modifications were also done in item number 18, in which the word ''Diabetes'' and the phrase ''visit my doctor once a year'' were substituted with ''Gestational Diabetes'' and ''attend antenatal appointment'', respectively. In addition, to culturally adapt the items to the study target group, in item number eight, the word ''walking a dog'' was substituted with the word ''walking'' (Table 1).

### Translation and validation process

*Forward translation*. The approval to use the GDMSES instrument was obtained from the developer of the original instrument. In the first phase, two professional bilingual translators were employed to translate the GDMSES scale from English into Arabic independently.

*Expert panels*. The two translated versions were then compared and analyzed by two Arabic researchers until they had a consensus that the Arabic version best reflects the language and concepts of the English version. As a result, the first draft of the Arabic version was produced. In the second step, the translated Arabic version of GDMSES was submitted to a panel of five experts from the same culture of the study target group to test the content validity of the Arabic version of the GDMSES. The panel of experts included two diabetes nurses, one diabetologist, and two lecturers in nursing. Panel members were asked to rate each item on a four-point scale (4 = very relevant, 3 = relevant with some adjustment to phrasing, 2 = only relevant if phrasing is profoundly adjusted and 1 = not relevant). The panel experts were also asked to provide comments on individual items about the clarity, accuracy and cultural relevance of the translation. As a result, the second version of the Arabic GDMSES was produced. The Content Validity Index (CVI) was used to establish the content validity of the tool. The CVI consisted of Item CVI (I-CVI), which was the proportion of experts who rate an item as relevant and the scale CVI (S-CVI), which was the proportion of items rated as relevant by all raters.[21] An I-CVI value of 0.78 or higher indicates acceptable content validity. The outcomes of the CVI processes are explained in the result section.

*Backward translation*. The second Arabic version of the GDMSES tool was then back-translated into English by a professional bilingual translator. The back-translated copy was remarkably similar to the original tool.

*Pretesting*. In the third step, the second version of the Arabic GDMSES was pilot tested among five pregnant women with gestational diabetes from the antenatal clinic at SQUH in Oman. The selected participants for the pilot testing were representatives of the target population of this study and were not included in the study. The five participants completed the instrument twice (at baseline and after 4 weeks) during the waiting time for their antenatal appointment. The retest was administered after four weeks from the initial test to decrease probability of recall bias. Further, participants were asked to provide their comments and suggestions

**Table 1** List of items removed or modified.

| No. | Items | Action | Reason |
|---|---|---|---|
| 19 | I am able to take my medication as prescribed. | Removed | Not applicable for all women with GDM. |
| 20 | I am able to adjust my medication when I am ill. | | |
| 7 | I am able to examine my feet for cuts. | | |
| 9 | I am able to adjust my eating plan when ill. | | |
| 18 | I am able to visit my doctor once a year to monitor my diabetes. | Substituted with ''I am able to visit the nearest health centre once a week or attend antenatal appointment to monitor my gestational diabetes'' | Unlike Type 2 diabetes which is a chronic disease, GDM is diagnosed during pregnancy and usually reverts to normal during postpartum period. |
| 8 | I am able to take enough exercise, for example, walking the dog or riding a bicycle. | Substituted with ''I am able to take enough exercise, e.g. walking or using the treadmill'' | Walking a dog is not applicable to the culture of the study target group. Riding a bicycle is not safe during pregnancy because of the risk of fall. |

about the clarity and comprehension of each item on the scale. The readability of the instruments was considered for 8th grade reading level using the Simple Measure of Gobbledygook (SMOG) Index. After revisions were made considering the pilot testing feedback of the participants, the final version of Arabic GDMSES was produced and was validated among 90 Omani pregnant women with gestational diabetes. Similar to the pilot test phase, the study participants completed the instrument twice (at baseline and after 4 weeks) during the waiting time for their antenatal appointment.

## Ethical considerations

Prior to the initiation of study procedures, protection of the human subjects' approval of the study was obtained from the Medical Research Ethics Committee at SQUH. Written informed consent was obtained from all of the participants before the start of the study. Participants were informed about the study purpose and the approximate time to fill the questionnaire. Each participant was informed that they were a volunteer in the study, they could ask questions they like and that they had the right not to answer any question. Participants were told that they have the right to withdraw from the study at any point of time. No threat or harm took place in this study other than the daily threat that the individual may have in daily life. Participants' privacy was maintained by allocating code numbers for each participant, and the principal investigator (PI) was the only person with access to the master list. Each participant's information and collected data were placed separately in a secure cabinet in a locked room. The data entered in the SPSS program could be accessed only by the PI.

## Statistical analysis

Data were analyzed using Statistical Package for the Social Sciences software (SPSS), version 24.[22] To test the instrument's reliability, internal consistency was determined by calculating the Cronbach alpha for the overall Arabic GDMSES scale. A Cronbach alpha score of more than .7 is considered satisfactory. Test–retest reliability was assessed using the Pearson correlation coefficient with a four-week interval between two tests. Content validity was examined by calculating the Content Validity Index (CVI) for each item in the Arabic GDMSES scale. The acceptable content validity score needed to be more than .7. The construct validity of the tool was examined using exploratory factor analysis (EFA).

## Results

### Participants' characteristics

In this methodological study conducted between October 2016 and January 2017, a sample of 90 forms of the GDMSES tool were completed by Omani pregnant women with gestational diabetes. All of the participants completed both the pre- and post-tests, with 0% attrition rate. The average age of the women was 33.5 years (range: 19–43 years old). The mean body mass index was $29.0 \, kg/m^2$ (range: $17.4–60.6 \, kg/m^2$). The majority (85.5%) of the women had an education level of high school or above.

### Content validity

The GDMSES measured perceived self-efficacy to adhere to healthy behaviours related to the management of gesta-

tional diabetes. The calculated content validity index (CVI) was between .8 and 1 for items in GDMSES, suggesting acceptable validity. Therefore, the final results of the content validity ended with a modified GDMSES version for Omani pregnant women with gestational diabetes. It included 16 items with a 10-point Likert-scale rated from 0 (lowest perceived self-efficacy) to 10 (highest perceived self-efficacy). A total score ranged 0–160 was calculated from the summation of all items with a higher score, indicating higher perceived self-efficacy to adhere to the recommended healthy behaviours.

## Construct validity

For this study, Kaiser–Meyer–Olkin (KMO) was 0.78, indicating that the sample size was well adequate in performing EFA.[23] Bartlett's test of sphericity gave a chi-square (df = 120) = 571.69, $p$-value < 0.001, indicating that there were factors with inter-related questions.

The coefficients in the component correlation matrix were less than .32, so an orthogonal rotation was used. Using the parallel analysis engine and eigenvalue approach led to extracting four factors (eigenvalue > 1). The total variance explained by the extraction sum of squares loadings was 60.49%. After suppressing coefficients lower than .3, factor loadings for the four-factor solution are seen in Table 2. Cronbach's alpha for each factor, as a measure of internal consistency, ranged between .61 and .83 and are also shown in this table.

## Internal consistency reliability and stability overtime

To test the instrument's reliability, internal consistency was determined by calculating Cronbach's alpha for the overall Arabic GDMSES scale. The internal consistency of the GDMSES was satisfactory, with a Cronbach's alpha coefficient .87 (standardized). Item-to-item correlation coefficients ranged between .27 and .61. Deleting one item at a time and recalculating Cronbach's alpha showed that those coefficients ranged from .85 to 0. 83 (Table 3). Test–retest reliability was assessed as well, using the Pearson correlation coefficient with a four weeks' interval between the two tests. Table 4 demonstrates that the DMSES instrument had a strong significant correlation over time with a Pearson correlation coefficient > .6. Overall, the internal consistency and the test–retest indicated that the study instruments had an acceptable reliability and are consistent over time.

## Discussion

Currently, there are no tools available to evaluate self-efficacy for diabetes self-management activities among pregnant with gestational diabetes. However, there are several reliable and valid tools originally designed for individuals with type 2 diabetes, one of which is the DMSES. This tool is a widely used tool to measure perceived self-efficacy to adhere to healthy behaviours related to the management of type 2 diabetes.[16] The self-management of gestational diabetes is comparable to the self-management of type 2

diabetes, and many items from DMSES would apply to pregnant women with GDM.[2]

This study translated the DMSES into Arabic and evaluated its psychometric properties in pregnant women with gestational diabetes. The psychometric results revealed that the culturally adapted Arabic-GDMSES is acceptable. Translation and back-translation of an instrument requires not only verbatim translation but also cultural adaption and applicability of the items among the target population. In this study, minor modifications have been done in item number 18, in which the word ''Diabetes'' and the phrase ''visit my doctor once a year'' were substituted with ''Gestational Diabetes'' and ''attend antenatal appointment'', respectively. In addition, out of the total 20 items in the original DMSES tool, 16 items were found applicable and valid to pregnant women with GDM, with the CVI ranging from .8 to 1 for each item.

To our knowledge, no other study has examined the validity or reliability of DMSES among pregnant women with GDM. Other than individuals with type 2 diabetes, DMSES was tested among family-carers of individuals with Type 2 diabetes in Thailand, in which the total CVI score of 14 applicable items (out of 20) was 0.93, indicating good content validity. The items' internal consistency, based on data collected from 67 Thai family-carers, was acceptable ($\alpha$ = 0.89).[24] This also broadens the scope of DMSES to populations other than patients with type 2 diabetes, including type 2 diabetes carriers and pregnant women with GDM. Future research may explore the applicability of DMSES to other populations, such as people with obesity or children with type 1 diabetes.

Similar to the original Dutch DMSES version, the Korean version and the Chinese version, the factorial construct validity in this study demonstrated that the Arabic-GDMSES comprises four factors, although the 16 items are clustered differently than the aforementioned versions.[18,25,26] For example, in the Dutch DMSES version, the construct validity of the tool revealed four factors that are (a) nutrition (specific) and weight (items 6,13,14,15 and 16); (b) nutrition (general) and medical treatment (Items 4, 5, 7, 9, 10, 17, 18, 19 and 20); (c) physical exercise (items 8, 11 and 12) and (d) blood sugar (items 1, 2 and 3).[18] Similarly, the Chinese version of DMSES showed four factors: (a) nutrition (items 4, 5, 9, 10, 13, 14, 15, 16 and 17), (b) blood sugar and feet check (items 1, 2, 3 and 7), (c) physical exercise and weight (items 6, 8 and 11) and (d) medical treatment (items 18, 19 and 20).[26] Interestingly, the current study revealed four logical categories related to GDM management plan: (a) nutrition and body weight (items 5, 6, 10 and 17), (b) adaptation to healthy eating (items 13, 14, 15 and 16), (c) physical activity and (d) treatment (items 8, 11, 12 and 18) and blood sugar (items 1, 2, 3 and 4). The slight difference in the subscales found between the current study and the Dutch and Chinese versions of DMSES may be attributed to the temporary nature of the gestational diabetes, where feet assessment and the adherence to the medications are not commonly included in the first line of the GDM management plan and may not be applicable for all pregnant women with GDM. Another possible reason for these differences is the use of insufficient sample size ($N$ = 90) for factor analysis. The same weakness has been reported in the Turkish version of the DMSES ($n$ = 101), which showed three factors.[27] In addition, one factor was

**Table 2** Final set of underlying factors identified by exploratory factor analysis.

| Description of items | Factors | | | |
|---|---|---|---|---|
| | 1 | 2 | 3 | 4 |
| *Nutrition and body weight* | | | | |
| I am able to choose different foods and stick to a healthy eating pattern. | .80 | | | |
| I am able to keep my weight under control. | .68 | | | |
| I am able to follow a healthy eating pattern most of the time. | .69 | | | |
| I am able to adjust my eating plan when I am feeling stressed or anxious. | .54 | | | |
| *Adaptation to healthy eating* | | | | |
| I am able to follow a healthy eating pattern when I am away from home. | | .89 | | |
| I am able to adjust my eating plan when I am away from home. | | .92 | | |
| I am able to follow a healthy eating pattern when I am on holiday. | | .42 | | |
| I am able to follow a healthy eating pattern when I am eating out or at a party. | | .80 | | |
| *Physical activity and treatment* | | | | |
| I am able to take enough exercise, e.g. walking or using the treadmill. | | | .82 | |
| I am able to take more exercise if the doctor advises me to. | | | .76 | |
| When taking more exercise I am able to adjust my eating plan. | | | .58 | |
| I am able to visit the nearest health centre once a week or attend antenatal appointment to monitor my gestational diabetes. | | | .59 | |
| *Blood sugar* | | | | |
| I am able to choose the correct foods. | | | | .48 |
| I am able to check my blood sugar if necessary. | | | | .69 |
| I am able to correct my blood sugar when the sugar level is too high (e.g. eat different food). | | | | .59 |
| I am able to correct my blood sugar when the blood sugar level is too low (e.g. eat different food) | | | | .69 |
| *Cronbach's alpha* | **.71** | **.83** | **.75** | **.61** |

**Table 3** Total to item correlation among items in tool (overall Cronbach's alpha = .85).

| Item | Corrected item-total correlation | Cronbach's alpha if item deleted |
|---|---|---|
| I am able to check my blood sugar if necessary. | .275 | .849 |
| I am able to correct my blood sugar when the sugar level is too high (e.g. eat different food). | .446 | .840 |
| I am able to correct my blood sugar when the blood sugar level is too low (e.g. eat different food). | .285 | .847 |
| I am able to choose the correct foods. | .516 | .837 |
| I am able to choose different foods and stick to a healthy eating pattern. | .503 | .837 |
| I am able to keep my weight under control. | .343 | .847 |
| I am able to take enough exercise, e.g. walking or using the treadmill. | .414 | .843 |
| I am able to follow a healthy eating pattern most of the time. | .549 | .835 |
| I am able to take more exercise if the doctor advises me to. | .528 | .837 |
| When taking more exercise I am able to adjust my eating plan. | .616 | .833 |
| I am able to follow a healthy eating pattern when I am away from home. | .594 | .832 |
| I am able to adjust my eating plan when I am away from home. | .580 | .832 |
| I am able to follow a healthy eating pattern when I am on holiday. | .446 | .840 |
| I am able to follow a healthy eating pattern when I am eating out or at a party. | .584 | .832 |
| I am able to adjust my eating plan when I am feeling stressed or anxious. | .446 | .840 |
| I am able to visit nearest health centre once a week or attend antenatal appointment to monitor my gestational diabetes. | .392 | .843 |

**Table 4**   Test–retest reliability ($N = 90$).

| Instrument | Mean | SD | Pearson correlation coefficient | *p* value |
|---|---|---|---|---|
| *Diabetes Management Self-Efficacy Scale (GDMSES)* | | | 0.67 | 0.00 |
| GDMSES score, test 1 | 122.96 | 19.92 | | |
| GDMSES score, test 2 | 121.11 | 23.03 | | |

identified for the UK-DMSES English version, and two factors were reported for the Italian-DMSES version, which is not consistent with the multifaceted nature of the diabetes management self-efficacy.[19,28]

Cronbach's alpha of the 16-item Korean DMSES introduced to the Korean population with type 2 diabetics was 0.92 ($p < 0.001$).[25] The original Dutch version of DMSES was also translated and found to be valid and reliable among people with type 2 diabetes from Turkey, Iran, Greek, China and Thailand.[26,27,29–31]

In our study, the test–retest reliability was .67 ($p < .001$), and Cronbach's alpha was 84. Another Arabic-version of DMSES was pilot tested among 10 adults with type 2 diabetes, where Cronbach's alpha coefficient of the total scale was 0.91.[32] We did not find other studies that tested the reliability of an Arabic-version of DMSES.

Using standard research process and psychometric evaluation methods is considered as a main strength point in the current study. However, a few limitations were reported in the current study, including the small sample size. A condition such as gestational diabetes that is temporary, not chronic, and limited resources make it more difficult to recruit such a large sample within the limited time period. Although the sample size was adequate for the psychometric analyses, the study findings should interpreted cautiously, and future study with a larger sample size is recommended. In addition, the generalizability of the findings would be limited, considering the recruitment of convenient participants from one Arabic country. Therefore, testing the tool among Arabic pregnant women from multisite within the Middle East region is recommended in the future.

## Conclusion

We aimed at translating, culturally adapting and assessing the psychometric properties of the Arabic version of GDMSES among pregnant women with gestational diabetes. In summary, the DMSES is a tool developed originally for individuals with type 2 diabetes, and the findings of the current study demonstrated that the GDMSES tool has good psychometric properties when used among Arabic pregnant women with gestational diabetes. This scale can be utilized in research and practice to assess diabetes management self-efficacy of pregnant women with gestational diabetes.

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## Conflict of interest

## Acknowledgment

## Appendix A.  Supplementary data

Supplementary data associated with this article can be found, in the online version, at doi:10.1016/j.jhqr.2021.12.004.

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