Assessing the Reliability and Validity of a Survey Questionnaire for Online Laboratory Courses in Mechanical Engineering Programs

Article history
Received
29 March 2024
Received in revised form
25 June 2024
Accepted
27 June 2024
Published online
30 June 2024

Noriah Yusoff[a*], Azli Abd Razak[a], Norliana Mohd Abbas[a]
[a]School of Mechanical Engineering, College of Engineering, Universiti Teknologi MARA (UiTM), Malaysia
**noriahyusoff@uitm.edu.my*

Abstract
In Mechanical Engineering academic program, the laboratory courses were conventionally hands-on nature that requires access to specialized equipment for practical learning experience purposes. However, immediate execution of Open and Distance Learning (ODL) during the global pandemic of COVID-19 has shaped new phenomena in teaching and learning including the laboratory courses. Assessment of the potential to continue with the online approach for the laboratory courses for better accessibility, flexibility, safety, and cost-effectiveness is necessary. This study aims to assess the validity and reliability of the designed survey questionnaires in investigating the suitability of conducting Mechanical Engineering laboratory courses in tertiary education via ODL method. The laboratory courses in Mechanical Engineering programs are diverse, each focusing on different areas of the discipline such as Manufacturing Process, Engineering Workshops, Applied Mechanics, Computer Aided Design and Thermofluids. However, the question was designed to suit all the laboratory courses offered by the program. Three domains of online delivery were investigated, the course delivery method, the assessment method, and suitability of the online delivery method. The reliability and validity of the survey questionnaire were assessed through a pilot test with a minimum of thirty respondents by using Principal Component Analysis (PCA) and Cronbach Alpha (CA). The analysis is done by deploying the Statistical Package for the Social Sciences (SPSS) software. The analysis results indicate the survey questionnaires are reliable and valid, the Cronbach Alpha value of 0.928 and Kaiser-Meyer-Olkin (KMO) index of 0.81. Thus, the survey questionnaires can be disseminated at large for the actual data collection purposes.

Keywords: Survey Questionnaire Assessment, Online Laboratory Course, Tertiary Education, Mechanical Engineering Academic Program.

Introduction

The COVID-19 pandemic has impacted the teaching and learning approach at universities globally. The pandemic brings challenges to the universities especially in the practical activities and laboratory exercises (Svatos et al., 2022). Online learning gained prominence during the pandemic, as it provided a crucial alternative to in-person education. Now that the pandemic has subsided, thus the necessity of continuing online learning, particularly for lab courses that traditionally rely on hands-on, in-person instruction should be investigated for the emergency remote teaching situation (Ferrie et. al., 2020).

Furthermore, in the engineering field the transition to online learning presents unique complexities, especially for courses and subject matter that contain technical elements (Asgari et al., 2021). Thus, an innovative Open and Distance Learning (ODL) using a reliable learning management system (LMS) is crucial (Cui et al., 2023). To immediately address this issue Universiti Teknologi MARA, School of Mechanical Engineering has taken the initiative to investigate the teaching and learning readiness of the laboratory courses among the students and the educators. Survey questionnaire approach is used for data collection for this exercise. Survey questionnaire is one of the means of collecting standardized quantitative primary data that are consistent and coherent for analysis (Satya & Roopa, 2017).

A survey questionnaire is a convenient way of gathering data from the target respondents in a period. The data gathering approach can be in the form of face-to-face interview, online survey, telephone interviews, and postal surveys (Ornstein, 2014). Technically, a survey questionnaire is just an ordinary list of questions for common people. But design of the questionnaire will determine the conclusiveness of the findings. Typically, the questionnaire must be well structured that include the language used, the type of the questions posted, the sequence of the questions arranged and many other attributes which have the direct impact to the survey results (Yaddanapudi et al.,

Yusoff, N., Abd Razak, A., Mohd Abbas, N. (2024), Assessing the Reliability and Validity of a Survey Questionnaire for Online Laboratory Courses in Mechanical Engineering Programs, *ASEAN Journal of Engineering Education*, 8(1), 70-75.

2019). Close-ended question allows the respondent to choose the predetermined responses, easier and faster but with limited information. Example of such questions are the one that is constructed using Likert scale (Taghinejad et al., 2023). On the contrary, open-ended questions requires the respondents to answer according to their perception and experience, it is time consuming but resulting to gaining deeper information (Ohji et al., 2021). A mixed of close and open-ended questions are likely to harvest high response rate with more informative data (Semyonov-Tal & Lewin-Epstein, 2021). Study shows that a well curated questionnaires able to generate an effective and accurate data of survey results (Taherdoost, 2016).

Despite of the urgency in getting the valuable insight of the required information, one should not compromise on the appropriate method of gathering the reliable data. Once the survey questionnaire is developed, pilot testing that assessing the reliability and validity of the set questions needs to be done (Yaddanapudi et al., 2019). Pilot test of the survey questionnaire is a critical step in the design of questionnaires before the actual data collection commences (Ornstein, 2014). Reliability is about the consistency of the survey questionnaire in attaining the answers from the respondents, despite of the gender differences in the set target group (Silva et al., 2023). Validity of the questionnaire relates to its accuracy in assessing what it was intended to measure, as indicated by the predetermined questions. (Koy et al., 2023). As matter of protocol, the reliability test needs to be performed before the validity test is done because the survey questionnaire must be consistent thus reliable then only rationale for the validity assessment (Sarmah & Bora Hazarika, 2012).

The study presents an assessment of the survey questionnaires in investigating the suitability of conducting Mechanical Engineering laboratory courses in Mechanical Engineering academic programs via ODL method. The pilot study was commenced to assess the reliability and validity of the survey questionnaire using Cronbach Alpha (CA) and Principal Component Analysis (PCA) test, respectively. Finally, the conclusion is made whether disseminating the survey questionnaire at large to the target respondents is viable or not.

Methods

This study was conducted in three stages. In stage 1 the survey questionnaire was designed according to the purpose of the study. Then in stage 2 the set questionnaires were disseminated to the target population for pilot testing. Stage 3 is where the reliability and validity of the survey questionnaires were analysed using Cronbach Alpha (CA) and Principal Component Analysis (PCA) test, respectively. The CA coefficient analysis is used to determine the internal consistency and homogeneity of items in Likert-type scales (Köse & Çelebioğlu, 2018). The interpretation of the CA coefficient internal consistency and homogeneity is available in Table 2 (Aithal & Aithal, 2020). The PCA is a useful method for the validity test for a newly developed survey questionnaires where factors in each understudy domains have not yet tested (Laura & Stephanie, 2011). The PCA is also recommended to be used when no prior theoretical basis or model exists (Taherdoost et al., 2014). The qualifying indicator for PCA test is Kaiser-Meyer-Olkin (KMO) that measures the sampling adequacy and Bartlett's Test that measures the chi-square, degrees of freedom, and p-value of the survey questionnaire or the instrument. The KMO coefficient is expected to be equivalent or above 0.7(Hair J et al., 2014). Whereas, for the Bartlett's Test, the chi-square output is considered significant when the p-value is less than 0.05 ($p< 0.05$)(Taherdoost et al., 2014).

Then, from here the factor extraction and factor loading were done to determine the number factors (in this case the questions set in the questionnaires) that needs to be extracted. It is basically to determine the number of factors that best represent the interrelationships among the set variables (Shrestha, 2021). It is said that the eigen value > 1 is considered significant and the factor loading value of >0.4 indicates the factors represent the purpose of the study (Shrestha, 2021).

All the above analyses were done by deploying the Statistical Package for the Social Sciences (SPSS) software.

Stage 1: Design of the Questionnaire

Discussion was conducted among the lecturers who are teaching the laboratory courses at the School of Mechanical Engineering, UiTM Shah Alam. The intention of the discussion is to get the insights of the relevant information needed for the study. Six engineering laboratory courses that are offered for the Bachelor (Hons) in Mechanical Engineering program were selected for the study. The courses are MEM564 (Manufacturing Processes Laboratory), MEM460 (Engineering Workshop Practice Laboratory), MEC424 (Applied Mechanics Laboratory), MEC435 (Computer Aided Design Laboratory), MEC454 (Thermofluids 1 Laboratory), and MEC554 (Thermofluids 2 Laboratory). For this study, three main domains were investigated: i) effectiveness of the teaching and learning delivery, ii) the assessment method, and iii) suitability for the Open and Distance Learning (ODL).

Table 1 presents the three main domains and the set questions for the investigation. Two types of question structure were adopted for the study, a close-ended and open-ended questions. The former was set with 5-likert scale quantification measurement and the latter was to get the qualitative feedback from respondents such as recommendation for improvement from students. The survey questionnaires were created using online google form. The online platform that are used for disseminating the

survey questionnaires are by Emails, WhatsApp, and Telegrams.

Table 1. The Questionnaire Domains and Descriptions

Domains	Descriptions
Online Distance Learning Suitability **1**.ODL suitability for this course [Material delivery (e.g., recorded video)] **2**.ODL suitability for this course [Teaching delivery] **3**.ODL suitability for this course [Learning activities] **4**.ODL suitability for this course [Assessment (e.g., report)] **5**.ODL suitability for this course [Knowledge/skill gained] **6**.ODL suitability for this course [Application of knowledge/ skill in assessment]	This domain reflects the respondents' perception on the suitability of the ODL for their specific needs; in the perspective of teaching and learning delivery as well as the assessment method.
Online Distance Teaching & Learning Delivery **7.**ODL delivery method [Live online lecture/ demonstration] **8**.ODL delivery method [Recorded video lecture/ demonstration] **9**.ODL delivery method [Recorded audio lecture/ demonstration (with slides)] **10**.ODL delivery method [Lecture note/manual]	This domain reflects the respondents' perception on the type of the teaching delivery of ODL.
Online Distance Learning Assessment **11**.ODL assessment [Asynchronous assessment type] **12**.ODL assessment [Synchronous assessment type] **13**.ODL assessment [Submission platform through LMS] **14**.ODL assessment [Submission through WhatsApp/ Telegram]	This domain reflects the respondents' perception on the assessment method during ODL.
Recommendation for Improvement from Students	This domain reflects the respondents' recommendations for improvements in ODL

Two types of question structure were adopted for the study, a close-ended and open-ended questions. The former was set with 5-likert scale quantification measurement and the latter was to get the qualitative feedback from respondents such as recommendation for improvement from students. The survey questionnaires were created using online google form. The online platform that are used for disseminating the survey questionnaires are by Emails, WhatsApp, and Telegrams.

Stage 2: Pilot Test

The pilot study commences with the MEM564 (Manufacturing Processes Laboratory) course. The survey questionnaires were disseminated via online to thirty (30) students that enrolled the course. Previous study suggests that the suffice pilot test sample size can be as minimum as 12 or 30 respondents (Sarmah & Bora Hazarika, 2012). Other study affirms that a minimum of 10 respondents per instrument is recommended (Laura & Stephanie, 2011). The pilot test is a screening process before the actual data collection begins. The advantage of the pilot test is it assists the researcher to detect any weaknesses in the questionnaire in terms of the theme, content, grammar, sentence structure, and the survey questionnaire layout format (van Teijlingen & Hundley, 2002). Close monitoring is done during this stage and any feedback or recommendations from the respondents are taken seriously for the next improvement. At this stage, the survey responses data cleaning is done to ensure that there are no duplications or errors such as incomplete responses in the data set since this data is consider as prime data. Processing the accuracy of the prime data before further analysis is crucial to ensure the outcome of the subsequent analysis is accurate and reliable (Mullat, 2011). The data cleaning activities is prerequisite before the reliability and validity test are performed.

Stage 3: Reliability and Validity Test

After the pilot test, the reliability and validity of the survey results were evaluated using Cronbach's Alpha (CA) and Principal Component Analysis (PCA), respectively. Once the reliability and the validity of the questionnaires are achieved, the survey questionnaire is ready for the distribution to the target populations; the six selected laboratory courses, MEM564 (Manufacturing Processes Laboratory), MEM460 (Engineering Workshop Practice Laboratory), MEC424 (Applied Mechanics Laboratory), MEC435 (Computer Aided Design Laboratory), MEC454 (Thermofluids 1 Laboratory), and MEC554 (Thermofluids 2 Laboratory).

Reliability: Cronbach Alpha (CA)Test

The reliability of the survey results is done to assess the internal consistency of the survey results. Cronbach Alpha (CA) coefficient is a common indicator to measure the internal consistency of the survey results of the intended purpose. Table 2 displays the list of CA value and its interpretation according to the degree of the reliability. Subject matter expert suggests

that Cronbach Alpha's value should at least 0.7 to indicate an adequate internal consistency and reliability in each questionnaire (Christmann & Van Aelst, 2006).

Table 2. Interpretation of Cronbach Alpha (CA) (Aithal & Aithal, 2020)

Value of Cronbach's alpha (α)	Degree of Reliability
1 α ≤ 0	A fundamental problem in the design of the questionnaire and the researcher should relook into the format of the questionnaire intended to use for the survey.
2 0 < α < 0.5	Low internal consistency and hence poor inter-relatedness between items. Should be discarded or revised.
0.5 < α < 0.7	0.5 < α < 0.7 Moderate internal consistency and reliability of a given questionnaire. Can be revised.
α = 0.7	Adequate internal consistency and reliability of each questionnaire.
0.7 < α < 0.9	High internal consistency and reliability in each questionnaire. Can be revised.
0.9 < α < 1.0	There are items in the questionnaires may be redundant, and the researcher must consider removing the items from the questionnaire. i.e. repeated questions in multiple ways.
α = 1.0	Perfect internal consistency in each questionnaire.

Validity: Principal Component Analysis (PCA) Test

The reliable components of the survey results were further analysed its validity using Principal Component Analysis (PCA) test. The PCA test is used to measure the principal components of the questionnaires. The PCA test provides empirically robust results and better indicator of the data variability presentation (Ajtai et al., 2023). The PCA analysis employs factor loadings that determine the common theme of the questions therefore the set questions are valid to be combined in the survey questionnaires. The range of factor loading scale is set by default in the SPSS, between (-ve) 1 to (+ve) 1 value. Generally, the PCA indicator of 0.6 and above are broadly accepted by many researchers (Aithal & Aithal, 2020).

Results and Discussions

Reliability and Validity of the Questionnaire

A total of thirty (30) students who have registered for the MEM564 (Manufacturing Processes Laboratory) course participated in the pilot test survey. Table 3 exhibits the processing summary of the pilot test survey response. The case processing summary indicates that all the survey response data are valid and 100% used for the analysis.

Table 3. Case Processing Summary for the Pilot Survey Response

Description		Number of Respondents	%
Cases	Valid	30	100.0
	Excluded[a]	0	0.0
	Total	30	100.0

[a] Listwise deletion based on all variables in the procedure.

Table 4 presents the reliability statistics analysis of the pilot survey response. The number of items in this analysis refers to the number of questions set in the survey questionnaires according to the teaching & learning delivery, the assessment method, and its suitability for the online distance learning (ODL) domains (Table 1 refers). Cronbach's Alpha (α), 0.928 indicates high internal consistency and homogeneity of the survey questionnaires.

Table 4. Reliability Statistics

Cronbach's Alpha (α)	Number of Items
0.928	14

Table 5 shows the Kaiser-Meyer-Olkin (KMO) and Bartlett's Test outcomes. The KMO coefficient of 0.81 indicates that the sample size of 30 respondents is appropriate for factor analysis. The Bartlett's sphericity test is significant with chi-square value of 387.688 and degree of freedom 91; ($p<0.05$). These results indicate that the sampling data is adequate and fit for the PCA test.

Table 5. KMO and Bartlett's Test

Kaiser-Meyer-Olkin (KMO) Measure of Sampling Adequacy		0.810
Bartlett's Test of Sphericity	Approximate; Chi-Square	387.688
	Degree of Freedom	91
	Significance (p value).	0.000

Table 6 highlights the extracted principal components results of the understudied fourteen (14) components. These components are based on the survey questions that are listed in Table 1 which categorised according to the three domains: ODL suitability, ODL Teaching & Learning Delivery and ODL assessment. In this study, principal components eigenvalue of more than 1 were extracted, with an eigenvalue of more than 1. The four dominant components are of the ODL suitability:

1. ODL suitability for this course [Material delivery (e.g., recorded video)]
2. ODL suitability for this course [Teaching delivery]
3. ODL suitability for this course [Learning activities]
4. ODL suitability for this course [Assessment (e.g., report)]

The four extracted components accounting to the total of 83.963% of the total variance. It is suggested that the proportion of the total variance should be at least 50%(Shrestha, 2021). The result shows 83.963% common variance shared by the 14 components can be accounted by the four said factors. This is the reflection of the KMO value of 0.810, which can be considered favourable and indicates that the factor analysis is useful for the variables.

Table 6. The Extracted Principal Components

Components (No)	Eigenvalues		
	Total	Variance %	Cumulative %
1	7.970	56.931	56.931
2	1.364	9.745	66.676
3	1.335	9.538	76.215
4	1.085	7.749	83.963
5	0.657	4.694	88.657
6	0.429	3.062	91.719
7	0.316	2.259	93.979
8	0.285	2.032	96.011
9	0.198	1.416	97.427
10	0.122	0.871	98.298
11	0.111	0.791	99.089
12	0.063	0.452	99.541
13	0.037	0.261	99.802
14	0.028	0.198	100.000

Kaiser-Meyer-Olkin Measure of Sampling Adequacy. 0.810
Bartlett's Test of Sphericity; Sig. (p = 0.000)

The first component accounts for the 56.931% of the total variance with eigenvalue of 7.970, the second component has explained 9.745% variance with eigenvalue 1.364, the third component explained for 9.538% variance with eigenvalue 1.335, and the fourth component explained for 7.749% variance with eigenvalue 1.085.

Table 7. Summary of Factor Loading

No	Components	Factor Loading
1	ODL suitability for this course [Material delivery (e.g. recorded video)]	0.869
2	ODL suitability for this course [Teaching delivery]	0.870
3	ODL suitability for this course [Learning activities]	0.884
4	ODL suitability for this course [Assessment (e.g. report)]	0.849
5	ODL suitability for this course [Knowledge/skill gained]	0.875
6	ODL suitability for this course [Application of knowledge/skill in assessment]	0.864
7	ODL delivery method [Live online lecture/demonstration]	0.885
8	ODL delivery method [Recorded video lecture/demonstration]	0.785
9	ODL delivery method [Recorded audio lecture/demonstration (with slides)]	0.795
10	ODL delivery method [Lecture note/manual]	0.772
11	ODL assessment [Asynchronous assessment type]	0.851
12	ODL assessment [Synchronous assessment type]	0.875
13	ODL assessment [Submission platform through LMS]	0.863
14	ODL assessment [Submission through WhatsApp/Telegram etc.]	0.718

Table 7 presents the summary of the Factor Loading for the underlying components. The average value of 0.840 (> 0.4) indicates all the components in this case the set questions represent the purpose of the study, in investigating the suitability of conducting Mechanical Engineering laboratory courses in tertiary education via ODL method. Hence, none of the questions that need to be extracted for that purpose and the survey questionnaires is good to go for the next level.

Thus, both reliability and validity tests indicate that the survey questionnaires are consistent and valid for distribution for larger data collection group. Also, the pilot sample size of thirty (30) respondents suffices for the preliminary qualifying analysis.

Conclusions

The pilot test provides a decisive view of the survey questionnaires conformity for the intended purpose. The Cronbach's Alpha value of 0.928 exhibits high internal consistency of the survey questionnaires.

Also, the pilot sample of thirty (30) respondents is adequate with the Kaiser-Meyer-Olkin (KMO) index of 0.81 (adequacy with merit). In addition, the Bartlett's sphericity test value of p = 0.000 indicates the sample is statistically significant and viable. It can be concluded that the set questions in the survey questionnaire are correctly understandable and interpretable by the intended respondents. Hence the survey questionnaires are ready for dissemination to the larger group for data collection purposes. Suggestion for future research work in the survey discipline is to explore more analysis function in the SPSS for the reliability and validity test such as test-retest reliability, inter-rate reliability, split-half reliability, and expert validation.

Acknowledgement

The authors would like to thank the members of the ODL team from the College of Engineering, Universiti Teknologi MARA Shah Alam who assisted in finalizing the questionnaire. Also, credits to the respondents who voluntarily responding to the questionnaire.

References

Aithal, A., & Aithal, P. S. (2020). Development and Validation of Survey Questionnaire & Experimental Data – A Systematical Review-based Statistical Approach. *International Journal of Management, Technology, and Social Sciences*, *103996*, 233–251. https://doi.org/10.47992/ijmts.2581.6012.0116

Ajtai, I., Ştefănie, H., Maloş, C., Botezan, C., Radovici, A., Bizău-Cârstea, M., & Baciu, C. (2023). Mapping social vulnerability to floods. A comprehensive framework using a vulnerability index approach and PCA analysis. *Ecological Indicators*, *154*(July). https://doi.org/10.1016/j.ecolind.2023.110838

Asgari, S., Trajkovic, J., Rahmani, M., Zhang, W., Lo, R. C., & Sciortino, A. (2021). An observational study of engineering online education during the COVID-19 pandemic. *PLoS ONE*, *16*(4 April), 1–17. https://doi.org/10.1371/journal.pone.0250041

Christmann, A., & Van Aelst, S. (2006). Robust estimation of Cronbach's alpha. *Journal of Multivariate Analysis*, *97*(7), 1660–1674. https://doi.org/10.1016/j.jmva.2005.05.012

Cui, Y., Ma, Z., Wang, L., Yang, A., Liu, Q., Kong, S., & Wang, H. (2023). A survey on big data-enabled innovative online education systems during the COVID-19 pandemic. *Journal of Innovation and Knowledge*, *8*(1), 100295. https://doi.org/10.1016/j.jik.2022.100295

Hair J, R, A., Babin B, & Black W. (2014). Multivariate Data Analysis. In Australia: Cengage: Vol. 7 edition (p. 758).

Köse, S., & Çelebioğlu, A. (2018). Validity and reliability of Turkish version of the scales of perceived stigma for children with epilepsy and their parents. International Journal of Nursing Sciences, 5(3), 238–242. https://doi.org/10.1016/j.ijnss.2018.07.004

Koy, V., Yunibhand, J., Rauth, A., Bircher, N., Prak, M., & Henker, R. (2023). Development and psychometric testing of a competency of nursing process questionnaire. *International Journal of Nursing Sciences*, *10*(2), 245–250. https://doi.org/10.1016/j.ijnss.2023.03.009

Laura, J. B., & Stephanie, M. M. (2011). Survey Instrument Validity Part 1: Principles of Survey Instrument Development and Validation in Athletic Training Education Research. Athletic Training Education Journal, 6(1), 27–35.

Mullat, J. E. (2011). Maximum Principle for Survey Data Analysis. *SSRN Electronic Journal*, *July 2009*. https://doi.org/10.2139/ssrn.1431089

Ohji, S., Aizawa, J., Hirohata, K., Ohmi, T., Mitomo, S., Koga, H., & Yagishita, K. (2021). Injury-related fear in athletes returning to sports after anterior cruciate ligament reconstruction - A quantitative content analysis of an open-ended questionnaire. *Asia-Pacific Journal of Sports Medicine, Arthroscopy, Rehabilitation and Technology*, *25*, 1–7. https://doi.org/10.1016/j.asmart.2021.03.001

Shrestha, N. (2021). Factor Analysis as a Tool for Survey Analysis. American Journal of Applied Mathematics and Statistics, 9(1), 4–11. https://doi.org/10.12691/ajams-9-1-2

Taghinejad, H., Mohammadyari, E., Tavan, H., & Mohammadyari, A. (2023). Investigating the validity and reliability of the GLFS-25 questionnaire by factor analysis in the elderly hospitalized at the intensive and cardiac care units. Heliyon, 9(7), e18111. https://doi.org/10.1016/j.heliyon.2023.e18111

Taherdoost, H. (2016). How to Design and Create an Effective Survey / Questionnaire; A Step by Step Guide Hamed Taherdoost To cite this version: HAL Id: hal-02546800 How to Design and Create an Effective Survey / Questionnaire; A Step by Step Guide. *International Journal of Academic Research in Management (IJARM)*, *5*(January 2016), 37–41.

Taherdoost, H., Sahibuddin, S., & Jalaliyoon, N. (2014). Exploratory Factor Analysis; Concepts and Theory To cite this version : HAL Id : hal-02557344 Exploratory Factor Analysis ; Concepts and Theory. Mathematics and Computers in Science and Engineering Series, 27, 375–382. https://doi.org/10.1016/j.measen.2022.100378

Van Teijlingen, E., & Hundley, V. (2002). The importance of pilot studies. *Nursing Standard (Royal College of Nursing (Great Britain) : 1987)*, *16*(40), 33–36. https://doi.org/10.7748/ns2002.06.16.40.33.c3214

Yaddanapudi, Sandhya, Yaddanapudi, & LN. (2019). How to design a questionnaire. *Indian Journal of Anaesthesia*, *49*(4), 257–262. https://doi.org/10.4103/ija.IJA_334_19.