Reliability and validity of the Thai version of the Dry Eye Questionnaire 5 (T-DEQ-5)

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Abstract

Purpose: To evaluate reliability and validity of the Thai translation of DEQ-5 questionnaire.

Setting/Venue: Online survey, Ophthalmology Department at Thammasat Hospital, Thailand

Method: Translation of the survey from English to Thai was done by ophthalmologists and linguists using focus group analysis. Content validity of the translated survey was assessed by 10 examiners who are fluent in both English and Thai. Validity indexes, Item Objective Congruence (IOC) and Content Validity Index (CVI) were collected. Then, 291 people completed the translated survey through an online database to calculate the reliability coefficient.

Results: T-DEQ-5 generated a Cronbach's Alpha value, mean IOC, mean CVI, and S-CVI of 0.86, 0.99, 0.90, and 0.88, respectively. The study enrolled a total of 290 respondents with a similar proportion between males and females with the most common age group being between 18 and 39 years. Almost 15% of the survey population wears contact lenses, while approximately 37% use eyeglasses. Less than half of the population have underlying diseases and are currently taking oral medications or using artificial teardrops.

Conclusion: The translated questionnaire has high validity and reliability and may be used in the clinical setting for diagnosis of DED.

Keywords: Reliability, Validity, Thai version of the Dry Eye Questionnaire 5 (T-DEQ-5)

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Introduction

Dry eye disease (DED) is a chronic ocular condition that affects the three layers of tear film: aqueous fluid, mucus, and fatty oils. The inflammatory condition causes reduced tear film stability affecting the ocular surface.[1] DED is a common complaint in ophthalmology with the highest prevalence in the South East Asian population. Studies have attributed the condition to multifactorial variables with risk factors including female sex, older age, computer use, contact lens wear, and environmental conditions such as pollution.[1-3] In a study by Lekhanont and colleagues[3], DED has a prevalence rate of 34% among 550 participants who visited the ophthalmology department for their annual eye exam in Bangkok, Thailand.

According to the Tear Film and Ocular Surface Society (TFOS) Dry Eye Workshop (DEWS) II[2], diagnosis of DED consists of assessment of clinical symptoms using

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questionnaires and at least one positive result of the markers of homeostasis which include tear breakup time, osmolarity, ocular surface staining. According to Wolffsohn[4], positive symptoms are defined as having a 5-item Dry Eye Questionnaire (DEQ-5) score of at least 6 or Ocular Surface Disease Index (OSDI) score of more than or equal to 13. Questionnaires regarding clinical assessment of DED were developed to aid in diagnosis because mild to moderate dry eye patients often present with only a few positive clinical signs with negative homeostasis markers.[5] One of the questionnaires used for diagnosis is DEQ-5 which was chosen for its short length and discriminate ability. The survey is a subset of the full DEQ which assesses dry eye symptoms in terms of frequency, intensity in the morning and later in the day, and degree of discomfort.[5]

DEQ-5 contains five items that significantly scored the highest correlation with the self-assessment of severity (SA-Sev).[5] The abridged survey assesses degree of watery eyes, discomfort, dryness, and late day (PM) intensity of discomfort and dryness with a specificity of 81% and sensitivity of 90% for cutoff point of 6 in differentiating between participants with and without dry eye.[5] The questionnaire is crucial for DED diagnosis, but a limitation is language as the survey is only available in English. This limitation creates a challenge for evaluating dry eye symptoms in patients who do not speak or read English. SubsequentlyHence, the survey has been translated and validated in other languages such as Spanish and Portuguese, but, to the best of our knowledge, has not been translated to Thai.[6, 7] Hence, in this study, we translated and validated a Thai version of DEQ-5 (T-DEQ-5) for clinical use.

Method

The study is a prospective cross-sectional study that incorporates translation and validation of DEQ-5 in the Thai language (T-DEQ-5). Translation of the survey from English to Thai was done by ophthalmologists and language experts. Forward translation from English to Thai, then backward translation from Thai to English was applied to the survey. The translated survey was assessed using focus group analysis. The finalized translation of T-DEQ-5 was evaluated by 10 examiners for content and construct validity in terms of Item Objective Congruence (IOC) and Content Validity Index (CVI). Internal consistency of T-DEQ-5 was evaluated using Cronbach's reliability coefficient which assess reliability of the survey translation. The examiners included 2 corneal and refractive surgery specialists, 2 general ophthalmologists, 2 general practitioners, 2 health care personnel in the ophthalmology department and 2 linguists, who were fluent in both English and Thai languages, as shown in Table 1. Examiners were chosen via purposive sampling based on their area of expertise. Examiners included in this study are those who frequently see patients with DED and are mostly likely to use the survey. The survey assesses attitude towards statements and questions regarding symptoms of DED. Survey questions utilize the Likert scale which allows respondents to express their positive to negative strength of agreement or feeling for each question.

Then, we invited the general population to complete the translated survey through an online database to calculate the reliability represented by Cronbach's alpha coefficient. The survey was presented using Google Form and links were shared to respondents who were willing to complete the survey. All participants provided informed consent prior to data collection. The Google Form collected personal information such as gender, age, chronic ocular diseases and refractive errors, underlying diseases, current medications, screen time, and duration of exposure to air-conditioning and sunlight, history of refractive surgery or ocular trauma, and use of corrective eyeglasses and contact lenses. The form contains Thai translations of 4 different dry eye questionnaires: OSDI, National Eye Institute Visual Function Questionnaire (NEI VFQ-25), DEQ - 5, and Standardized Patient Evaluation of Eye Dryness (SPEED), in that order.

The study was approved by the Research Ethics Committee 1, Faculty of Medicine at Thammasat University. The inclusion criteria for participants were ages between 18 to 80 and ability to read and understand Thai language. The exclusion criteria were impaired cognitive function, patients with diseases that affected the ocular surface such as Parkinson's disease, corneal transplantation recipients, and participants who had ocular surface surgery. A total of 291 volunteers completed the survey,

but 290 participants were included in the study. The study period spanned from August 1, 2022 until January 31, 2023.

Table 1: Characteristics of Survey Examiners including area of expertise, age and gender

No.	Expert	Age (years)	Gender
1	Thai qualified cornea and refractive surgery specialist	39	Female
2	Thai qualified cornea and refractive surgery specialist	37	Male
3	Thai qualified general ophthalmologist	41	Female
4	Thai qualified general ophthalmologist	38	Female
5	Thai qualified general practitioner	29	Male
6	Thai qualified general practitioner	30	Female
7	Eye technician	41	Female
8	Eye technician	43	Female
9	Linguist	29	Female
10	Linguist	34	Female

Results

A total of 291 participants completed the T-DEQ-5; however, one participant was excluded due to age. Table 2 depicts the demographics of survey participants including gender, age, chronic ocular diseases, comorbidities, screen time, and exposure to air-conditioned environments. Out of 290 respondents, 138 were female, 145 were male and 7 did not identify as male or female. The most common age group was between the ages of 18 to 39 with a total of 253 participants. The least common age group was between 65 to 80 years of age with only 2 respondents. Almost 15% of the survey population wears contact lenses, while approximately 37% use eyeglasses. Out of 290 people, 110 participants have underlying medical conditions such as allergic rhinitis and dyslipidemia. Similarly, 129 respondents reported currently taking medications such as antihistamines, antihypertensives, statins and using artificial teardrops. Almost 80% of participants reported more than 6 hours of exposure to air-conditioned environments, while about 45% of respondents spend more than 6 hours using screen displays such as smartphones, tablets and computers.

Table 2: Demographics of survey respondents included in the study (n = 290) presented as number of participants and percentage of respondents

Characteristic	Number of Respondents (n)	Percentage of Respondents (%)
Sex		
Female	138	47.6
Male	145	50.0
Others	7	2.4
Age		
18 - 39	253	87.2
40 - 64	35	12.1
65 - 80	2	0.7
Use of corrective glasses	108	37.1
Use of contact lenses	42	14.4

Table 2: Demographics of survey respondents included in the study (n = 290) presented as number of participants and percentage of respondents (Cont.)

Characteristic	Number of Respondents (n)	Percentage of Respondents (%)
Presence of underlying medical conditions	110	37.8
Currently on medical prescriptions	129	44.3
Known DED diagnosis	5	1.7
More than 6 hours of air-conditioning per day	226	77.9
More than 6 hours of screen time per day	132	45.5

Table 3: T-DEQ-5 results from participants

Question No.	Mean Score	SD
1	1.12	0.96
2	0.78	0.85
3	1.30	1.06
4	0.87	0.95
5	0.68	0.86
Total score	4.74	3.75

Like the DEQ-5 survey, T-DEQ-5 contains five questions with a range of choices to answer. For questions 1a, 2a, and 3, respondents can choose one of four answers which are never, rarely, sometimes, frequently, constantly denoted by the numbers 0 through 4, respectively. Meanwhile, questions 1b and 2b contain five choices which are never, not intense at all until very intense indicated by a scale from 0 to 5, respectively. The mean scores for questions 1 through 5 were 1.12, 0.78, 1.30, 0.87, and 0.68 with SD values of 0.96, 0.85, 1.06, 0.95, and 0.86, respectively. The mean and SD values of the total score was 4.74 and 3.75, respectively. Data collected using T-DEQ-5 demonstrated that out of 290 respondents, 102 participants scored at least 6 points on the survey indicating they have DED. However, more than half of the respondents, 188 or 64.8%, did not have DED.

Table 4: Prevalence of Survey Respondents with and without DED

Variable	Respondents with DED	Respondents without DED
Number (n)	102 (35.2%)	188 (64.8%)

Table 5: Indexes of Item-Objective Congruence (IOC), Content Validity Index (CVI), and Items level Content Validity Index (I-CVI) of T-DEQ-5

No.	Question	Indexes of Item-Objective Congruence (IOC)	Content Validity Index (CVI)	Items level Content Validity Index (I-CVI)
1	- Questions about EYE DISCOMFORT: คำถามเกี่ยวกับการอาการไม่สบายตา	1	0.93	0.9
1a	- During a typical day in the past month, how often did your eyes feel discomfort? ในเดือนที่ผ่านมาคุณมีอาการไม่สบายตาบ่อยเพียงใดต่อวัน	0.9	0.88	0.9

Table 5: Indexes of Item-Objective Congruence (IOC), Content Validity Index (CVI), and Items level Content Validity Index (I-CVI) of T-DEQ-5 (Cont.)

No.	Question	Indexes of Item-Objective Congruence (IOC)	Content Validity Index (CVI)	Items level Content Validity Index (I-CVI)
1b	- When your eyes feel discomfort, how intense was this feeling of discomfort at the end of the day, within two hours of going to bed? เมื่อคุณมีอาการไม่สบายตาคุณรู้สึกว่าอาการรุนแรงเพียงใด ภายในระยะเวลา 2 ชั่วโมงก่อนเข้านอน	1	0.88	0.9
2	- Questions about EYE DRYNESS: คำถามเกี่ยวกับอาการตาแห้ง	1	0.95	0.9
2a	- During a typical day in the past month, how often did your eyes feel dry? ในเดือนที่ผ่านมาคุณมีอาการตาแห้งบ่อยเพียงใดต่อวัน	1	0.88	0.8
2b	- When your eyes felt dry, how intense was this feeling of dryness at the end of the day, within two hours of going to bed? เมื่อคุณมีอาการตาแห้งคุณรู้สึกว่าอาการรุนแรงเพียงใดภาย ในระยะเวลา 2 ชั่วโมงก่อนเข้านอน	1	0.88	0.9
3	- Questions about WATERY EYES: คำถามเกี่ยวกับอาการน้ำตาไหล	1	0.93	0.9
3a	- During a typical day in the past month, how often did your eyes look or feel excessively watery? ในเดือนที่ผ่านมาคุณมีอาการน้ำตาไหลบ่อยเพียงใดต่อวัน	1	0.88	0.8
	Total	0.99	0.90	0.88

Table 6: Reliability index of T-DEQ-5 demonstrated by Cronbach's alpha

Cronbach's Alpha	Number of Items
0.86	5

T-DEQ-5 was analyzed by 10 experts: two cornea specialists, two general ophthalmologists, two general practitioners, two eye technicians and two English linguists. The IOC index is 1 for all questions except item 2 which scored 0.9. Translations of all eight questions had I-CVI scores of at least 0.8 with items 1-4, 6 and 7 scoring the highest score of 0.9 and questions 5 and 8 scoring the lowest score of 0.8. The validity results were indicated by IOC indexes between 0.9-1.0 with mean 0.99, and CVI scores between 0.88-0.95 with mean 0.90. The I-CVI result ranges between 0.8-0.9 and a total scale level Content Validity Index (S-CVI) of 0.88.

Internal consistency of T-DEQ-5 was evaluated using Cronbach's reliability coefficient. T-DEQ-5 yielded a Cronbach's Alpha of 0.86 which indicates internal consistency between responses to all five questions. Since all five questions assess the degree of dry eye symptoms, it is crucial for the translated survey to have high internal consistency.

Discussion

According to T-DEQ-5 results, the prevalence of DED in the Thai population is 35.2% which corresponds to previous studies that revealed prevalence rates between 20-52.4% in Southeast Asian populations.[2] Similarly, another study done in Bangkok, Thailand found a prevalence of 34% of participants with symptomatic DED.[3] The proportion of male and female respondents were similar at 50.0% and 47.6%, respectively, which may reduce the

effects of confounding factors as female sex is a potential risk factor of DED.[1] The majority of respondents are in the younger age group of between 18 to 39 which can be attributed to our survey type being done via an online platform. Hence, the main demographic of our study is the younger generation who are exposed to devices with screens at a young age which may affect the incidence of DED.

A majority of respondents did not have prior diagnoses of ocular conditions and only 5 participants or 1.7% have prior diagnoses of DED, despite the fact that the study revealed 35.2% of respondents have positive clinical symptoms of DED. This finding indicates that although people had symptoms of DED, they did not seek medical attention; hence have never been diagnosed with DED. This may be attributable to many factors including severity of symptoms, access to healthcare or lack of knowledge in symptoms of DED. A substantial portion of participants spent at least 6 hours per day using devices with screens and were exposed to drying environments such as air-conditioning.

Some studies revealed that extended use of digital devices with visual display is associated with reduced spontaneous blinking rate and positive clinical symptoms of DED.[8,9] Furthermore, another study found a correlation between prevalence of symptomatic DED and windy and air-conditioned environments.[10] The questionnaire was shared via an online platform to target respondents who have access to technological devices. As we plan to implement T-DEQ-5 in future clinical settings, an online-based survey is compatible with modern day context. With globalization of modern day technology, more and more people have access to devices such as phones, tablets and laptops. Therefore, an online based survey will also increase patient's accessibility to the survey.

There are several studies on the validation of translated DEQ-5 in other languages which produced credible questionnaires.[6,7] However, the results of other translations of DEQ-5 were difficult to compare with our study due to the differences in validation methods and indexes. Regardless, T-DEQ-5 demonstrated high validity of congruence and consistency with mean IOC, mean CVI, and S-CVI of 0.99, 0.90, and 0.88, respectively. The mean and individual IOC values of more than 0.50 for all five items indicate that the questionnaire has good validity in terms of congruence. The CVI scores of more than 0.70 demonstrate good performance in terms of content. Moreover, the translated survey revealed high reliability with a Cronbach's Alpha value of 0.86 which indicates appropriate and reliable translations of all five questions.

The study was intentionally designed as an online-based survey as we ultimately plan to implement T-DEQ-5 in future clinical settings. With the rise in technological advancements, there is increasing ease in access to digital devices. Hence, the online survey will be easily accessible and can be done anywhere and anytime including out-of-office hours. Furthermore, the online platform will also help raise awareness of DED among younger populations.

On the other hand, a limitation of this study is the disproportionate demographics of respondents. The majority of respondents were ages 18 to 39 with only two participants between the ages of 65 to 80. Since age has been found to be a potential risk factor of DED[1], the results may be influenced by the study's disproportionate demographics. Therefore, the results of DED prevalence found in this study may not be representative of the entire Thai population. The demographics is affected by the survey's online platform which mainly targets people who are more familiar with using technological devices.

Conclusion

The study demonstrated a prevalence of DED in the Thai population of 34% which is similar to the results of previous studies and is considered quite high when compared to Caucasian populations.[2,3] Participant demographics reveal a possible association between DED and drying environments.[10] The online-based survey targets younger populations creating a disproportionate participant group, which may affect the study results.

T-DEQ-5 scores high in reliability and validity indexes and also internal consistency. All in all, the T-DEQ-5 is one of the first translations of DEQ-5 into Thai language and proves to be a potential tool that can be used in clinical settings for evaluation of DED in the Thai population. Future work with this survey is to recruit a larger and more diversified study group that also includes the offline population. We plan to create an online application for DED screening

and diagnosis, especially for younger generations with high accessibility to technological devices with visual screens.

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