ORIGINAL ARTICLE Open Access

Perceived knowledge and use of IOTN-DHC among dental officers in Sabah

Jin Han Lee*

Unit Ortodontik, Pusat Pakar Pergigian Sabah, Jalan Kebajikan, 88100 Kota Kinabalu, Sabah.

Abstract

This cross-sectional study assessed the knowledge and use of IOTN-DHC among dental officers in Sabah. A self-administered, anonymous, and structured questionnaire in the format of Google form were used. The questionnaire addressed socio-demographic characteristics, knowledge and use on IOTN-DHC. Data were entered into a standardised collection form and were analysed descriptively and inferentially. All respondents knew IOTN (n=224, 100.00%). More than half used both components (n=115, 51.34%). Most had training on IOTN-DHC (n=187, 83.48%). The main sources of training were workshop or course (n=128, 57.14%) and undergraduate training (n=109, 48.66%). More than half felt confident in using IOTN-DHC (n=135, 60.27%). Dental officers graduated from local public universities (n=54, 80.60%), had working experience five years and above (n=66, 72.53%), and had previous training (n=125, 66.84%) were confident. IOTN-DHC was used to assess treatment eligibility (n=220, 98.21%), to grade malocclusion (n=170, 75.89%), to communicate with colleagues (n=149, 66.52%), and to communicate with patients (n=69, 30.80%). Majority needed more training (n=210, 93.75%). Methods beneficial were hands on workshop or course (n=201, 89.73%), poster in surgery room (n=161, 71.88%), webinar (n=131, 58.48%), online educational materials (n=102, 45.54%), and textbooks (n=66, 29.46%). In conclusion, the perceived knowledge and use of IOTN-DHC among dental officers in Sabah were moderate. Graduated from local public universities, had longer working experience, and had previous IOTN-DHC training contributed to better confidence of the dental officers. Yearly training sessions are important to enhance the knowledge, use, and confidence in using IOTN-DHC.

Received:
11 June 2025
Revised:
21 January 2026
Accepted:
12 February 2026
Published Online:
28 February 2026
How to cite this article:
Lee, J.H. (2026). Perceived knowledge and use of IOTN-DHC among dental officers in Sabah. *IIUM Journal of Orofacial and Health Sciences*, *7*(1), 46–53. https://doi.org/10.31436/ijohs.v7i1.418
Article DOI:
https://doi.org/10.31436/ijohs.v7i1.418
***Corresponding author**
Address:
Unit Ortodontik, Pusat Pakar Pergigian Sabah, Jalan Kebajikan, 88100 Kota Kinabalu, Sabah.

Telephone: +6088-346900

Email address:
jinjinhlee@yahoo.com

Keywords: *confidence, dental officers, IOTN-DHC, knowledge, use*

Introduction

Index of Orthodontic Treatment Need (IOTN) was developed in United Kingdom in year 1989 and is since widely used to assess the need and eligibility of children under 18 years of age for National Health Service orthodontic treatment. There are two components in this index; the Dental Health Component (DHC) and the Aesthetic Component (AC) (Brook & Shaw, 1989).

The DHC uses scale of 1 to 5 to rate treatment need, with grade 1 represents no treatment need, grade 2 represents little treatment need, grade 3 represents borderline need, grade 4 represents treatment required, and grade 5 represents great need for treatment. It evaluates the severity of malocclusion (Shaw *et al*., 1991) based on missing teeth, increased or decreased overjet, crossbite, crowding, and increased or decreased overbite. Along with a number grade, a letter is assigned to identify and record specific

deviant occlusal anomalies (Jawad *et al*., 2016).

IOTN-DHC is reliable over time (Cooper *et al*., 2000) and almost perfect reproducibility (Alwakeel & Barakah, 2023; Shaw *et al*., 1991). IOTN-DHC is a guide to prioritize patients who are more in need of orthodontic treatment (Negri *et al*., 2021). It ensures that limited allocations are fairly utilized for patients in need of treatment (Bhagyalakshmi *et al*., 2015) and would benefit most from the treatment. It has allowed orthodontists to standardise their approach in evaluating treatment need (de Oliveira 2003). Meanwhile, AC comprises of ten photographs to represent severity of malocclusion, ranging from 1 (most attractive) to 10 (least attractive). The AC does not reflect the patients' perception and AC alone is inadequate to identify the orthodontic treatment need (Hsu *et al*., 2014).

Currently, dental officers in the government service in Malaysia are encouraged to use IOTN-DHC to grade the orthodontic treatment need of the patients when they refer patients for orthodontic consultation (Program Kesihatan Pergigian, 2022). An audit done by Ringgingon *et al.* (2025) found that more than 20% of the orthodontic referrals by dental officers in the Federal Territory of Labuan had inaccurate IOTN scoring. Incorrect or inaccurate use of this index can have an impact on patient treatment and orthodontic service. Inappropriate referrals to the orthodontists can contribute to the waste of time and resources for both patients and clinicians, while failing to refer eligible patients can also mean patients missed the orthodontic treatment they need.

Therefore, this study assessed the self-perceived knowledge and self-reported use of IOTN-DHC among dental officers in government service in Sabah. The findings would be useful to determine whether the dental officers may need more training sessions on the knowledge and use of IOTN-DHC, and hence improve the efficiency and accuracy of orthodontic referrals.

Materials and Methods

This was a cross-sectional study. A self-administered, anonymous, structured questionnaire in the format of Google form were distributed to all dental officers in Sabah through their head of department. The inclusion and exclusion criteria were informed to the head of department to facilitate the distribution of the questionnaire to the target group. The information sheet regarding this study was attached together. Informed consent was considered given by the participants once they answered and submitted the questionnaire.

The inclusion criteria were dental officers who were working in government service in Sabah during the time of questionnaire distribution. The exclusion criteria was dental officers who had orthodontic postgraduate qualification. The sample size was 163 and was calculated using prevalence formula (Naing *et al*., 2022). Ethical approval for this study was obtained from the Medical Research and Ethics Committee (MREC), Ministry of Health Malaysia and registered with the National Medical Research Register (NMRR-ID-22-02532-MXK).

The questionnaire used in this study was not fully adapted from any previous study, but was newly developed by the researcher based on the findings from previous studies (Jawad *et al*., 2016; Ho-A-Yun *et al*., 2009; Puri *et al*., 2015). It was validated by two orthodontists and was pre-tested by dental officers prior to the start of this study.

This questionnaire addressed two aspects: socio-demographic characteristics, and knowledge and use on IOTN-DHC. Socio-demographic variables included age, gender, details on the dental school they graduated from, and the number of years they had served in the government service as dental officers.

In the knowledge and use of IOTN-DHC, there were eight questions. The participants were asked whether they had heard of IOTN,

which IOTN component they used, whether they had proper training in IOTN-DHC, details from where they had their IOTN-DHC training, whether they felt confident in using IOTN-DHC, their purpose of using IOTN-DHC, whether they needed more training in IOTN-DHC in future, and which methods they thought they might benefit from to improve their knowledge and use of IOTN-DHC.

The data were entered into a standardised data collection form. All variables were analysed descriptively using Stata 15. The differences between female dental officers and male dental officers with respect to knowledge and use on IOTN-DHC, and the confidence in using IOTN-DHC were tested using Fisher's exact test. The level of significance was set at 5% ($p < 0.05$).

Results

A total of 224 dental officers answered and submitted the questionnaire. The response rate was 80.0%. Mean age of the respondents was 29.35 ± 0.25 years. More than three-quarters of the respondents were females. The number of dental officers graduated from overseas universities, local private universities, and local public universities were almost equal. The mean working experience of the respondents as dental officers was 4.16 ± 0.23 years (Table 1).

Regarding the knowledge and use on IOTN-DHC, all respondents knew IOTN (n=224, 100.00%). Most of the respondents had training on using IOTN-DHC (n=187, 83.48%). More than half of the respondents felt confident in using IOTN-DHC (n=135, 60.27%). Majority of the respondents thought they need more training in using IOTN-DHC (n=210, 93.75%). The knowledge and use of IOTN-DHC between the female and male dental officers were found not statistically significant, p > 0.05 (Table 2).

Table 1. Demographic profile of the respondents.

Variables		n (%)	Mean ± SE (years)
Age		-	29.35 ± 0.25
Gender	Female	174 (77.68)	-
	Male	50 (22.32)	-
Graduated from	Overseas universities	79 (35.27)	-
	Local private universities	78 (34.82)	-
	Local public universities	67 (29.91)	-
Working experience		-	4.16 ± 0.23

Table 2. Knowledge and use on IOTN-DHC.

Questions on IOTN-DHC knowledge and use	Yes n (%)	No n (%)	*p* value *
Have you heard of IOTN?	224 (100.00)	0 (0.00)	-
Do you have training on using IOTN-DHC before?	187 (83.48)	37 (16.52)	0.280
Do you feel confident in using IOTN-DHC?	135 (60.27)	89 (39.73)	0.624
Do you think you need more training in using IOTN-DHC?	210 (93.75)	14 (6.25)	0.520

*Fisher's exact test

More than half of the respondents used both components of IOTN (n=115, 51.34%), followed by DHC only (n=102, 45.54%). Only 0.89% (n=2) used AC alone, and 2.23% (n=5) were not sure which component of IOTN they used (Figure 1).

The sources of their training were IOTN workshop or course (n=128, 57.14%), undergraduate training (n=109, 48.66%), and journal (n=13, 5.80%) (Figure 2).

The respondents used IOTN-DHC to assess treatment eligibility (n=220, 98.21%), to grade malocclusion (n=170, 75.89%), to communicate with colleagues (n=149, 66.52%), and to communicate with patients (n=69, 30.80%) (Figure 3).

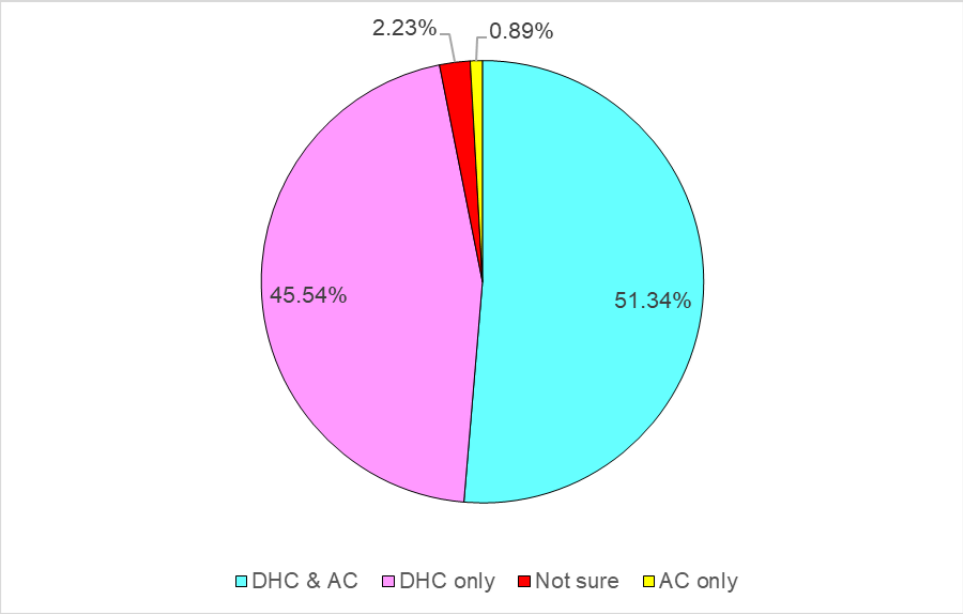

Figure 1. IOTN components used by respondents.

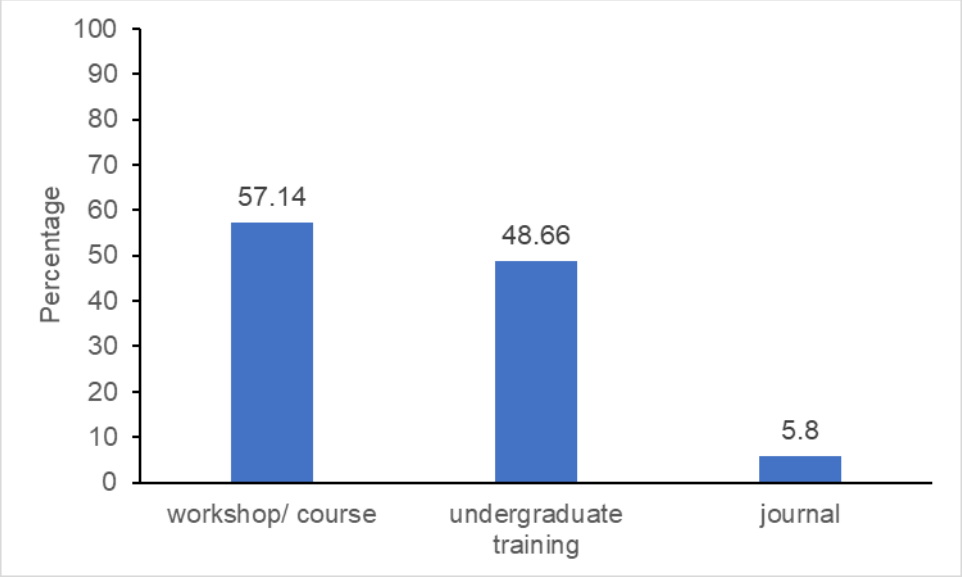

Figure 2. Training sources of the respondents on IOTN-DHC.

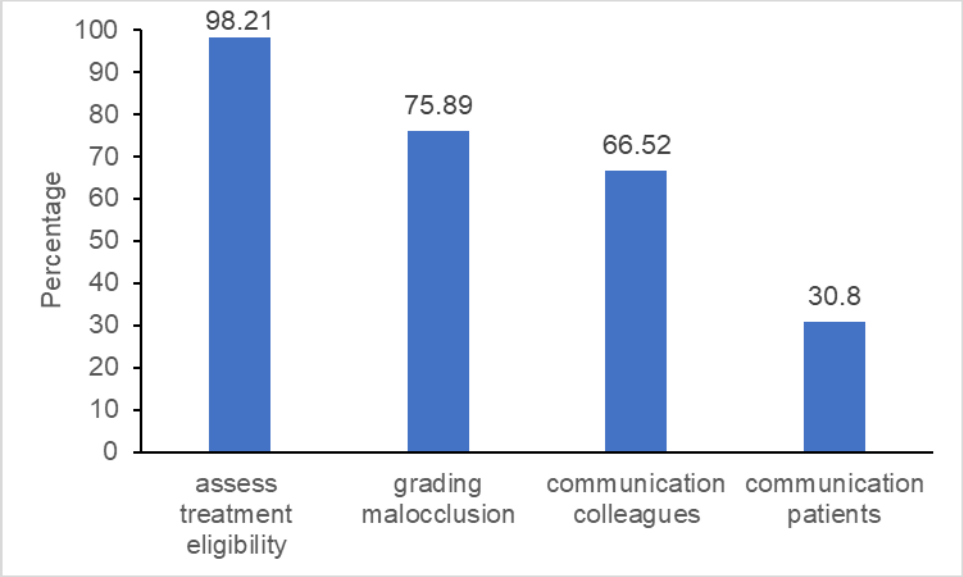

Figure 3. Purposes of using IOTN-DHC.

The highest percentage of dental officers graduated from local public universities (n=54, 80.60%) felt confident in using IOTN-DHC, followed by dental officers graduated from overseas universities (n=47, 59.49%). In contrast, more dental officers graduated from local private universities (n=44, 56.41%) felt not confident in using IOTN-DHC. These findings were statistically significant, $p < 0.05$) (Table 3).

Higher percentage of dental officers who had worked in the government service for five years and above (n=66, 72.53%) were confident in using IOTN-DHC than the dental officers who had worked less than five years (n=69, 51.88%) in service. These findings were statistically significant, $p < 0.05$ (Table 3).

More than two-thirds of dental officers who had IOTN-DHC training (n=125, 66.84%) were confident in using IOTN-DHC. Majority of the dental officers who did not have IOTN-DHC training (n=27, 72.97%), were not confident in using IOTN-DHC. These findings were statistically significant, $p < 0.05$ (Table 3).

Regarding the methods that the respondents felt were beneficial to encourage the use of IOTN-DHC, hands on IOTN workshop or course were the most popular (n=201, 89.73%), followed by IOTN poster put up in surgery room (n=161, 71.88%), webinar (n=131, 58.48%), educational material available online (n=102, 45.54%), and orthodontic textbooks (n=66, 29.46%) (Figure 4).

Table 3. Confidence in using IOTN-DHC among the dental officers.

Variables		Confidence		*p* value *
		Yes, n (%)	No, n (%)	
Graduated from	Overseas universities	47 (59.49)	32 (40.51)	0.000
	Local private universities	34 (43.59)	44 (56.41)	
	Local public universities	54 (80.60)	13 (19.40)	
Working experience	Less than five years	69 (51.88)	64 (48.12)	0.002
	Five years and above	66 (72.53)	25 (27.47)	
Had IOTN-DHC training before?	Yes	125 (66.84)	62 (33.16)	0.000
	No	10 (27.03)	27 (72.97)	

*Fisher's exact test

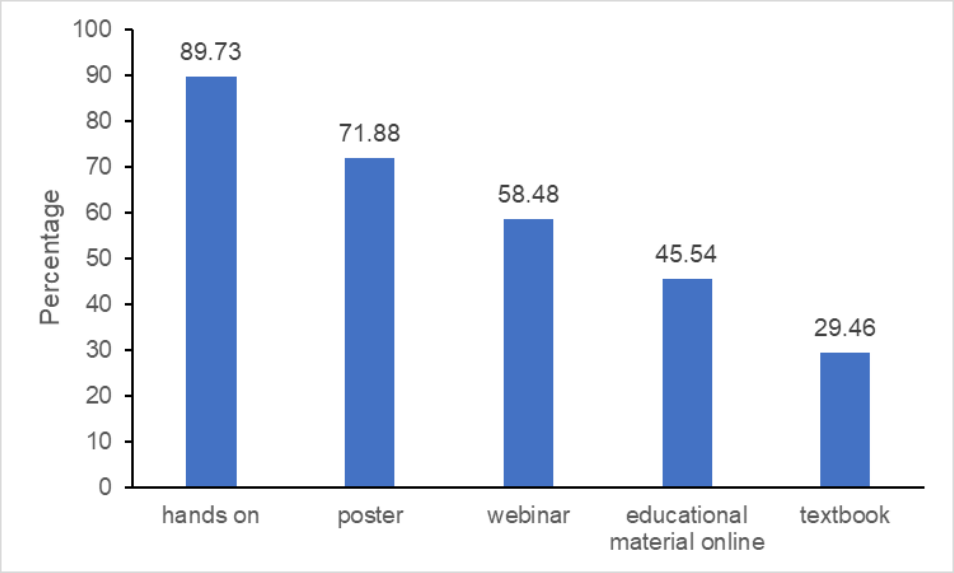

Figure 4. Methods beneficial to encourage the use of IOTN-DHC.

Discussion

IOTN acts as an educational tool to improve the diagnostic skill of the dental officers (Loke, 2007). It could be useful for prioritizing treatment due to lack of manpower and resources. This could reduce the long waiting list for orthodontic treatment, especially in government clinics (Wahab, 2007).

In this study, knowledge was the awareness gained by experience or lesson, while use was the practise of IOTN-DHC. There were high awareness and usage of IOTN-DHC among dental officers in Sabah. However, the number of respondents felt confident to use IOTN-DHC was lower than the number of respondents who had formal trainings. More than half of the respondents did not have undergraduate training on the use of IOTN-DHC. Moreover, a few of the respondents were unable to recognize DHC and AC. The IOTN diagnostic accuracy of the dental officers was found low (Loke & Tan, 2017). Orthodontic referral might not be very much emphasized or taught in undergraduate syllabus in some universities. The inadequacy in correctly applying the IOTN-DHC might be due to lack of clinical experience in assessing patients and making referrals (Bouskandar *et al.*, 2023). To strengthen the dental officers on knowledge and use of IOTN-DHC, undergraduate teaching by the lecturers, is essential.

Based on the responses, the major sources of IOTN-DHC training were at workshop and course. Yearly workshop and course to train or refresh the knowledge and use of IOTN-DHC among the dental officers, especially the new dental officers, are important (Jawad *et al.*, 2016; Ringgingon *et al.*, 2025). These could increase their confidence and competence in using IOTN-DHC. Moreover, almost all of the respondents were looking forward to more training sessions on IOTN-DHC, which showed positive eagerness to learn, despite more than 80% had training before.

In terms of confidence in using IOTN-DHC, the categories of dental officers who felt confident were dental officers who graduated from local public universities, dental officers who had longer working experience in government service, and dental officers who had previous IOTN-DHC training. These show that exposure to IOTN-DHC training and usage is very important to the dental officers' confidence.

IOTN-DHC poster put up at surgery room served as a quick reference for the dental officers when they need to refer patients for orthodontic consultation. More respondents sought educational materials online than

orthodontic textbooks due to convenience and updated information. However, orthodontic textbooks still served as important source of knowledge on IOTN-DHC.

Meanwhile, webinar allows knowledge delivery regardless of participants' location or time, especially sessions can be recorded and replayed. Webinar had gained popularity during the pandemic and lockdown period (Nepal, 2020). The advantages of webinar include cost and time savings since travel is not required, as well as ease of conducting and convenient knowledge sharing. However, the disadvantages of webinar are the dependence on technology, good internet access, barrier for effective interaction between the speaker and the participants, and participants might get distracted easily. Webinar continues as online educational platform even after the pandemic (Dev *et al*., 2022). Hence, webinar on IOTN-DHC might serve as a useful and convenient platform to reach all the dental officers in Sabah.

The limitation of this study is online questionnaire may lack of direct interaction between the researcher and the participants and no time limit to complete the questionnaire. This might lead to misinterpretation of the questions as the participants could not directly clarify their doubt. In addition, the findings were based on self-perceived knowledge and self-reported use of IOTN-DHC, which may not reflect actual competency. If time and resources permit, future studies could use on-site questionnaire administered at conferences, seminars, or workplaces to achieve higher engagement and immediate clarification of queries. Participants might be requested to score the IOTN-DHC based on malocclusion study models or photos within time limit. These will give more accurate information and deeper understanding of the knowledge and use of IOTN-DHC among the dental officers.

Conclusion

The perceived knowledge and use of IOTN-DHC among dental officers in Sabah were moderate. Graduated from local public universities, had longer working experience, and had previous IOTN-DHC training contributed to better confidence of the dental officers in using IOTN-DHC. Yearly training sessions on IOTN-DHC are important to enhance the knowledge, use, and confidence of the dental officers.

Acknowledgement

The author would like to thank the Director General of Health Malaysia for permission to publish this article.

Conflict of interests

The author declared no conflict of interest in this research

References

Alwakeel, R., Barakah, D. (2023). Applicability of IOTN Index for quality assessment of orthodontic treatment difficulty. *Journal of Indian Orthodontic Society*, 57(4), 268-272.

Bhagyalakshmi, A., Shivalinga, B.M., Balasubramanian, S., Suma, S. (2015). The Index of Orthodontic Treatment Need- a review. *International Journal of Recent Scientific Research*, 6(8), 5835-5839.

Bouskandar, S.Y., Muraikhi, L.A., Hodge, T.M., Barber, S.K. (2023). UK dental students' ability and confidence in applying the Index of Orthodontic Treatment Need and determining appropriate orthodontic referral. *European Journal of Dental Education*, 27(3), 489-496.

Brook, P.H., Shaw, W.C. (1989). The development of an index of orthodontic treatment priority. *European Journal of Orthodontics*, 11, 309-320.

Cooper, S., Mandall, N.A., Dibiase, D., Shaw, W.C. (2000). The reliability of the Index of Orthodontic Treatment Need over time. *Journal of Orthodontics*, 27, 47-53.

De Oliveira, C.M. (2003). The planning, contracting and monitoring of orthodontic services, and the use of the IOTN index: a survey of consultants in dental public health in the United Kingdom. *British Dental Journal*, 195, 704-706.

Dev, P., Thyavihally, B.Y., Waigankar, S.S., Agarwal, V., Pednekar, A.P., Shah, A. (2022). The value of webinars during COVID-19 pandemic. A questionnaire-based survey. *Indian Journal of Urology*, 38(3), 204-209.

Ho-A-Yun, J., Crawford, F., Clarkson, J. (2009). The use of the Index of Orthodontic Treatment Need in

dental primary care. *British Dental Journal*, 206, E16.

Hsu, E.E.H., Myo, Y.Y., Yee, H.H., Win, S.S. (2014). A study of Index of Orthodontic Treatment Need and perception of personal dental appearance among dental students. *Myanmar Dental Journal*, 21(1), 60-66.

Jawad, Z., Bates, C., Hodge, T. (2016). Can dental registrants use the Index of Orthodontic Treatment Need accurately? Part 1: Knowledge of IOTN among dental registrants. *British Dental Journal*, 220(10), 527-532.

Loke, S.T. (2007). Efficacy of training dental officers in the Index of Orthodontic Treatment Need (IOTN). *Malaysian Dental Journal*, 28(1), 24-31.

Loke, S.T., Tan, S.Y. (2017). Competency of primary care officers in referring patients for orthodontic treatment using IOTN. *Malaysian Dental Journal*, 2, 1-29.

Naing, L., Nordin, R.B., Abdul Rahman, H., Naing, Y.T. (2022). Sample size calculation for prevalence studies using Scalex and ScalaR calculators. *BMC Medical Research Methodology*, 22, 209.

Wahab, R.M.A. (2007). The expert says IOTN as a tool in prioritizing orthodontic treatment. *Malaysian Dental Journal*, 28(1), 32-33.

Negri, P., Vena, F., Lomurno, G., Coniglio, M., Cianetti, S., Gatto, R., Severino, M. (2021). Index of Orthodontic Treatment Need (IOTN) and distribution of malocclusion traits in a population of growing patients attending a public orthodontic service in Perugia (Italy). *European Journal of Paediatric Dentistry*, 22(4), 303-308.

Nepal, P.R. (2020). Role of webinars in medical educations during pandemic of COVID 19. *Eastern Green Neurosurgery*, 2, 1-2.

Program Kesihatan Pergigian. (2022). Garis panduan rujukan rawatan ortodontik di fasiliti perkhidmatan pergigian Kementerian Kesihatan Malaysia (KKM). *Kementerian Kesihatan Malaysia*, 1-17.

Puri, A., Ho-A-Yun, J., McGuiness, N.J. (2015). Use and knowledge of IOTN among GDPs in Scotland. *British Dental Journal*, 218, 399-404.

Ringgingon, L.P., Hway, B.C.X., Chin, M.H. (2025). An audit on orthodontic referrals by government dental officers in the Federal Territory of Labuan. *Malaysian Dental Journal*, 48(1), 19-24.

Shaw, W.C., Richmond, S., O'Brien, K.D., Brook, P., Stephens, C.D. (1991). Quality control in orthodontics: Indices of treatment need and treatment standards. *British Dental Journal*, 170(3), 107-112. https://doi.org/10.1038/sj.bdj.4807429