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Review Article

Education Section

Effectiveness of the Structured and Conventional Methods of Viva Examination in Medical Education: A Systematic Review and Meta-analysis

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ABSTRACT

Introduction: Oral examination (viva voce) is one of the common assessment methods for medical students. Literature shows that Conventional Oral Examination (COE), is a widely adopted method and uses a consolidated scoring system. There came an alternative method, Structured Oral Examination (SOE) that uses the recommended rating scale (prevalidated questions and markings). The emergence of a new method raised the research question of whether the conventional or structured oral examination is effective in assessing medical students.

Aim: To evaluate the effectiveness of traditional and structured viva voce examination across the specialties in medical education.

Materials and Methods: A systematic review was conducted on 18 peer-reviewed articles about conventional and structured oral examination among medical students. Medical Education Research Study Quality Instrument (MERSQI) was used to assess the quality of evidence.

Results: The level of evidence was moderate where the MERSQI score ranges from 7.5-15.5 for the 18 articles included in the review process. SOE overcomes COE by assessing students' cognitive skills, communication skills, behaviour and attitude whereas COE principally assesses the recall knowledge. Analytical and reasoning power remains the predominant domain in SOE. With psychometric properties like good reliability, sensitivity and acceptability, SOE remains the best strategy for the evaluation of medical students. Pooled results in the forest plot showed no difference in the viva voce marks between COE and SOE with a mean difference of 0.46 (p=0.53).

Conclusion: The review analysis revealed that there is no difference in the mean marks scored by COE and SOE. However, a SOE will allow examiners to assess the medical students' learning achievement with no partiality, stress, and anxiety compared to COE.

Keywords: Assessment, Dental education, Structured oral exam, Unstructured oral exam, Viva voce

INTRODUCTION

The knowledge and skills of medical students have been assessed using written and oral examinations since 1950. An oral examination (viva voce) is an interview between a candidate and one or more examiners holding an important place in a medical examination [1]. The oral examination is a way of assessing the candidates' ability to understand and express the ideas in particular topics and judging how deep they understand them [2].

The conventional or traditional or unstructured oral examination is an interview or discussion between examiner(s) and student in the absence of patients [3]. This COE mainly focuses on the professional aspects of medical subjects like practice-oriented knowledge, mental sharpness, positive verbal communication and subtle decision making [4,5]. In this method, each student receives different questions about the content addressed, the difficulty of the question, and different levels of prompting or help. It has been claimed that this oral examination format is not uniform, too subjective and is more prone to errors [6,7].

The SOE is recently used in the assessment of medical education, including basic medical subjects. SOE assesses the knowledge, skills and attitude of the students using a set of predetermined questions [8]. It is well planned in content and competencies to be assessed in a specific duration and is supported by a checklist. Though, SOE is well framed, it increases apprehension among the students (difficulty level of questions, problem solving type of questions, direct feedback) and reluctance among the faculty members (SOE demands detailed planning, prevalidated well-structured questions, scoring criteria, resources and manpower) in terms of implementation [9]. It is the need of the hour to decide whether COE or SOE will help in a successful medical student's examination.

This systematic review aimed to evaluate the effectiveness of the COE and SOE in all disciplines of medical education and consolidate the results based on students' test scores.

MATERIALS AND METHODS

The present study was a systematic review and a meta-analysis. There was no language restriction placed and articles published from 2010 to March 2019 were included. This time frame was selected since the structured viva examination entered its major application in medical education in the previous decade [10]. The study was conducted from August 2021 to February 2022. This review work on published literature did not require ethical approval and informed consent.

Search strategy: The databases such as MEDLINE, Cochrane, and Google scholar were used for the search. Keywords of published articles and MeSH terms were the search terms. Search criteria using MeSh terms had been built. These terms were refined using keywords of published articles. The search terms were connected by Boolean Operators 'AND', 'OR', and 'NOT' to find all relevant articles. Search terms used were oral examination, assessment tool, viva, viva voce, interactive exam, structured, traditional, medical education, medical students and dental students, reliability.

Inclusion criteria: Articles published in peer-reviewed journals with comparative analysis of SOE and COE in medical and dental education were included in this review.

Exclusion criteria: Oral examination of medical and dental education at the undergraduate level had been included, excluding nurses, physical therapists, pharmacologists and other healthcare professionals. The Objectively Structured Clinical Examination (OSCE), multiple mini-interviews types of assessment and narrative or literature reviews describing the importance of structured oral examination were excluded from the review.

Selection process: The retrieved articles from the database search and hand search were screened for the title. Duplicates were excluded. Three researchers read the abstracts and full text of selected articles separately and then discussed their findings. The review process continued after the agreement between the researchers. In case of any conflict of interest, all researchers read the articles again for further discussion and decision.

Data extraction: A data extraction spreadsheet was developed using Microsoft excel®. This sheet was divided into study identification (author, year), study population and settings (number of participants, subject), study design (intervention, comparison), study method and measurement, study outcomes and study citation parts. The data extraction sheet was pilot tested with five articles. After making necessary corrections to the sheet, it was applied to all the selected studies. A double review of the abstracts and full text articles was conducted.

Quality Assessment: MERSQI scale was used for the quality assessment as it assesses the methodological rigor of articles [11,12]. MERSQI tool consists of six domains which include study design, sampling, type of data, validity of evaluation instrument, data analysis, outcomes. The scoring is based on the 10 items within the six domains ranging from 0 to score 3 for each domain. Thus, the maximum score will be 18 for an article [Table/Fig-1].

Domain	Item (score)	No. of studies (%)	MERSQI score
Study design	**Study design**		
	Single group cross-sectional or single group post-test only (1)	1 (5.6)	1
	Single group pretest and posttest (1.5)	10 (55.6)	15
	Non randomised, 2 groups (2)	5 (27.7)	10
	Randomised controlled trial (3)	2 (11.1)	6
Sampling	**Institutions studied**		
	>2 institutions (1.5)	0	0
	2 institutions (1)	1 (5.6)	1
	1 institution (0.5)	17 (94.4)	8.5
	Response rate (%)		
	>75% (1.5)	18 (100)	27
	50-74% (1)	0	0
	<50% or not reported (0.5)	0	0
Type of data	**Type of data**		
	Assessment by study participants (1)	5 (27.7)	5
	Objective measurement (3)	1 (5.6)	3
	Both subjective and objective (4)	12 (66.7)	48
Validity of evaluation instrument	**Internal structure**		
	Not reported (0)	4 (22.2)	0
	Reported (1)	14 (77.8)	14
	Content		
	Not reported (0)	8 (44.5)	0
	Reported (1)	10 (55.5)	10
	Relationship to other variables		
	Not reported (0)	15 (83.3)	0
	Reported (1)	3 (16.7)	3
Data analysis	**Appropriateness of analysis**		
	Inappropriate for study design/type of data (0)	2 (11.2)	0
	Appropriate for study design/type of data (1)	16 (88.8)	16
	Complexity of analysis		
	Descriptive analysis only (1)	6 (33.3)	6
	Beyond descriptive analysis (2)	12 (66.7)	24
Outcomes	**Outcomes**		
	Satisfaction, attitudes, perception, opinions, general facts (1)	5 (27.7)	5
	Knowledge, skills (1.5)	1 (5.6)	1.5
	Behaviours (2)	0	0
	Both perception, opinion and knowledge, skills (2.5)	12 (66.7)	30
	Patient/health care outcome (3)	0	0

[Table/Fig-1]: MERSQI domain and item scores for 18 studies.

The scale is comprehensive with its list of 10 review items and also has evidence for its validity. This scale adopts Kirkpatrick's four-level model to approach the effectiveness construct [13]. The first level (reaction) focuses on the participants' perceptions of the intervention, the second level (learning) evaluates knowledge, skills, and attitudinal change, and the third level measures changes in behaviour. The fourth level (results) focuses on the organisation's benefits because of the intervention.

STATISTICAL ANALYSIS

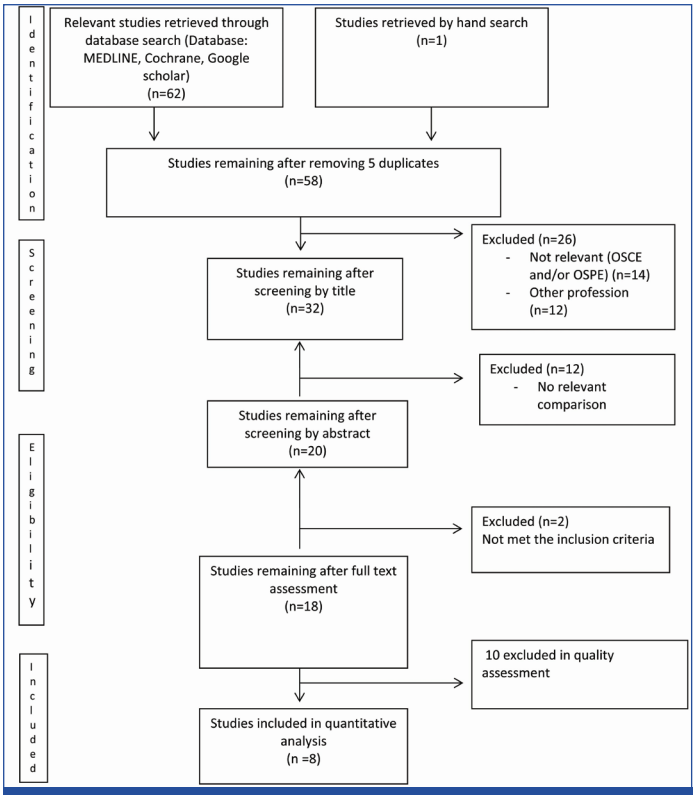
Descriptive statistics such as percentages were used to analyse the data based on MERSQI domain perspectives. MERSQI score for each article based on all sections was calculated. The total number and percentage of articles for each MERSQI domain were also calculated. Two reviewers conducted a meta-analysis using RevMan 5.4 (Cochrane Collaboration, Copenhagen, Denmark) to yield outcomes. Mean±Standard Deviation (SD) was chosen for expressing the results of continuous outcome (mean viva voce marks). I^2 test was used to test the heterogeneity. We selected the random effect model to merge data if I^2 >40%; otherwise, a fixed effect model was used. The 95% Confidence Interval (CI) was adopted in this review.

RESULTS

After the initial search through PubMed, Cochrane Library, Google Scholar, and hand search. Using the search terms and MeSH terms, 63 relevant articles were obtained. During the first stage of screening, 58 articles remained after removing five duplicates. Then, 38 articles were removed subsequently by screening titles and abstracts. After assessing the full texts, two articles were excluded for not fulfilling the inclusion criteria. Total 18 articles [14-31] were finally included in qualitative synthesis and eight articles were included in quantitative synthesis [15,17,21-23,28,30,31] [Table/Fig-2].

Qualitative assessment: Most of the SOE to study its effectiveness was administered at only one institution (94.4%). These study articles reported that structured viva voce had positive effects on the overall experience and student satisfaction compared to traditional viva voce [14-31]. However, the level of scientific evidence and effectiveness varied among the studies. The MERSQI scale helped us to identify the quality of evidence. This scale reported that the quality of evidence of all included articles was moderate [Table/Fig-1].

Out of 18 articles, only 2 (11.1%) articles used Randomised Controlled Trials (RCT) to test the effectiveness of SOE. The study design used in most of the articles was a single group with pretest and post-test (55.6%) followed by a non randomised two groups study (27.7%). Single group pretest and post-test study design got



[Table/Fig-2]: PRISMA flowchart for study selection.

the highest MERSQI score of 15, followed by a non randomised two groups and RCT study design with a score of 10 and 6, respectively. The single group cross-sectional study design got the least MERSQI score of 1.

When assessed for the outcomes, eight articles assessed both the mean viva voce marks and students' perception [15-17,21, 23,26,28,31]. Two studies assessed the student's perception alone, and one study assessed both student and teachers' perception [18,19,25]. Three studies assessed viva voce marks, and the perception of both students and teachers [22,24,30]. Three studies analysed the structured viva voce questionnaire and conducted perception survey among the participants [19,20,27] and one study [14] explored the reliability of structured viva voce and mean marks.

To evaluate the students' perception regarding SOE, 12 (66.7%) studies used open-ended and closed-ended questionnaires. The closed-ended questionnaire was collected as students' feedback based on a 2-point (yes or no) and a 5-point (strongly agree to strongly disagree) Likert scale. Most of the studies 12 (66.7%) assessed the outcome subjectively and objectively. Also, about 14 (77.8%) of the test instruments had internal validity tests. The authors of 16 (88.8%) articles used appropriate statistical tests according to MERSQI. Similarly, 66.7% of the studies used inferential statistics besides descriptive statistics. All studies included in this review had an excellent response rate of 75%.

The MERSQI score that can be obtained by a study ranged from 5-18 points. According to [Table/Fig-3], the highest score for an article was 18 and the lowest score was 7.5. All the studies (100%) framed the SOE as question set cards or question template. The questions in the question sets were from must know (core) and nice to know (non core) areas. These questions were set with increasing grades of difficulty from easy to very difficult and the questions used were recall, analytical and reasoning power types.

The participants of all studies were undergraduate medical and dental students. The structured viva voce questions were developed from the following specialties: Community medicine, physiology, pathology, microbiology, biochemistry, pharmacology, periodontology, molecular biology, integrated basic science, forensic medicine and anatomy.

Almost all the studies 15 (83.3%) compared structured viva voce against traditional viva voce [15-23,26-31], and one study measured the reliability of structured viva voce and one study reported sensitivity and specificity of structured viva voce [14,18].

The structured viva voce strategy was stated explicitly as "recall, analytical and reasoning power" and "must know, good to know, and nice to know" types in 14 (77.7%) articles [15-22,24-27,30,31]. The remaining four articles [14,23,28,29] have not mentioned the strategy [14,23,28,29]. Of 13 articles that assessed the viva voce marks, 3 (16.6%) articles reported that the marks obtained by the students were higher in traditional viva voce than in structured viva-voce. Almost, 78% of the participants in all studies felt that SOE can be introduced in the formative assessment. Total 11 (61.1%) articles had mentioned the time frame allotted for structured viva examination which ranged from 5-15 minutes, whereas no time frame had been mentioned for traditional viva examination [14,15,17,20-22,25-27,29,30].

Meta-analysis: Eight studies compared the mean viva voce marks. The forest plot was produced according to the mean viva voce marks of the conventional and structured oral examination. The results of the meta-analysis showed no significant difference (p=0.53) in the mean viva voce marks with the conventional and structured oral examination (MD, 0.46; 95% CI, -0.99 to 1.92) [Table/Fig-4]. A random effect model was adopted because of high heterogeneity with a total sample of 81.

DISCUSSION

A systematic review was planned to find out whether structured viva voce or traditional viva voce is effective in terms of assessment scores, perception and reliability in the evaluation of medical students. In consonance with the structured viva voce scheme, 77.7% of researchers followed recall, analytical and reasoning power domains for viva voce. This finding makes us think that formative assessment in medical education focuses on these three domains rather than any other additional domains. Viva voce is the most effective concept for the evaluation of clinical reasoning skills, an essential component of medical practice and requires psychometric properties in terms of reliability and validity [32,33].

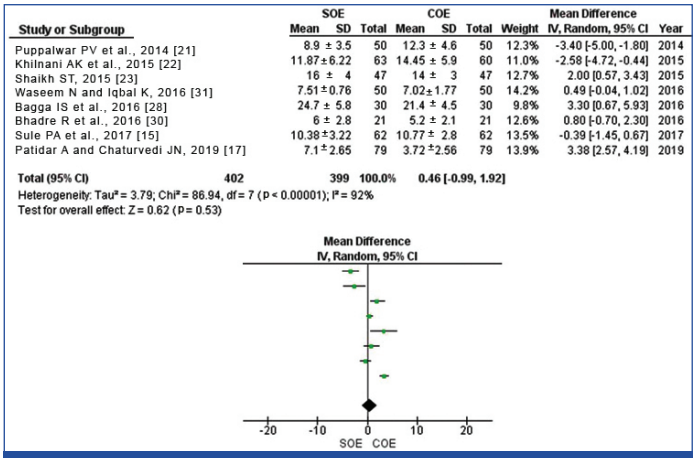
Based on this review results, there was no significant difference in the marks scored by the medical and dental students using COE and SOE. However, structured viva voce eliminates inappropriate bias by careful selection and training of examiners, use of more formal structured questions and application of this structure to assess the candidate making this concept a reliable and valid one. It has been suggested that rating candidates separately in three fields: recall, analytical and problem solving will improve their reliability [34]. Providing training sessions for examiners to promote scoring consistency and conducting mock examinations for implementation integrity will make this concept most effective [35].

Of two articles that assessed the reliability of structured viva voce, one compared the reliability of the system by administering the 7th day and 14th day after a one month lecture [14]. Another one compared the inter-rater and internal consistency reliability between structured and traditional viva voce [15]. These reviews reflect that structured viva voce has good reliability among students and examiners. Besides reliability and validity, the acceptability of structured viva voce among students and teachers was also assessed in all studies. Students expressed that structured viva voce was better than traditional viva voce based on certain criteria assessed by the closed-ended questionnaire. The criteria were that structured viva voce had a well organised system, covered most of the topics in the syllabus, questions were from all levels, allotted time was adequate and questions were comprehensive. In an open-ended questionnaire, students and teachers in all studies felt that structured viva voce had no partiality, no cross-questions, encourages deep learning, is transparent and fair, but requires training.

Author, year	Study population	No. of partici-pants	Subject	Setting	Study design	Methods	Time frame for viva voce	Measurement	Outcome and result	MERSQI score
Shah HK et al., 2013 [18]	III-year MBBS students	70	Community medicine	Goa Medical College, Goa, India	Single group pretest and post-test	Question set cards with direct and applied questions	Not mentioned	Students' perception	87% preferred SVE than CVE	7.5
Shenwai MR and Patil KB 2013 [19]	I-year MBBS students	93	Physiology	Smt. Kashibai Navale Medical College, Pune, Maharashtra, India	Single group pretest and post-test	Question checklist with recall, analytical and reasoning power questions	Not mentioned	Students' perception	50% of students rated SVV as good tool and 72.04% were satisfied with SVV compared to 44% and 63% in TVV	8.5
Gor SK et al., 2014 [20]	II-year MBBS students	120	Pathology	Gujarat Adani Institute of Medical Sciences, Bhuj, Gujarat, India	Single group pretest and post-test	Question set cards with knowledge, understanding and analytical questions	5 min for SVV and no time frame for USVV	Knowledge and skill, students' perception	Correlation coefficient between MCQs and SVV is 0.52 with 0.22 for MCQs and USVV	12.5
Puppalwar PV et al., 2014 [21]	I-year MBBS and BDS students	50	Biochemistry	Jawaharlal Nehru Medical College, Wardha, Maharashtra, India	Single group pretest and post-test	Questions with recall (easy), knowledge (difficult) and application (very difficult) structure	8 min for OSVV and no time frame for TVV	Knowledge and skill, students' perception	Mean marks obtained in SVV is 8.9 and 12.3 in CVV, but there is a perfect agreement (0.876) between examiners in SVV and fair agreement (0.319) in CVV	14.5
Khilnani AK, et al., 2015 [22]	II-year MBBS students	113	Pharmacology	GMERS Medical College, Gujarat, India	Randomised controlled trial	Question cards with easy, difficult, very difficult questions	10 min for SVV and no time frame for CVV	Knowledge and skill, students' perception	Mean marks obtained in COE 14.45 and 11.87 in SOE but internal consistency between 2 examiners is more in SOE	18
Shaikh ST, 2015 [23]	I-year MBBS students	47	Anatomy	K J Somaiya Medical College, Mumbai, vMaharashtra, India	Single group pretest and post-test	Not mentioned	Not mentioned	Knowledge and skill, students' perception	Mean marks in SVE are 16 and 14 for TVE. 82.6% students felt SVE as unbiased one	13.5
Vankudre AJ, et al., 2016 [24]	III-year MBBS students and faculties	264	Community medicine	Dr. Vasantrao Pawar Medical College, Nashik, Maharashtra, India	Single group pretest and post-test	Question checklist with theory and applied questions with increasing grades of difficulty	Not mentioned	Students and faculty perception	70% strongly agreed SOE is uniform, 81% comprehensive, 23% felt stressed compared to 58% in TVV	9
Dangre Mundey G et.al., 2016 [25]	II-year MBBS students and faculties	506	Microbiology	Jawaharlal Nehru Medical College, Wardha, India	Single group pretest and post-test	Question set cards with easy, difficult and very difficult questions	9 min for OSVV and no time frame for TVV	Students and faculty perception	68% of students and 100% of faculties agreed that OSVV is an effective tool	8
Dhasmana DC, et al., 2016 [26]	II-year MBBS students	128	Pharmacology	Himalayan Institute of Medical Sciences, Dehradun, Maharashtra, India	Non randomised 2 group	Question cards with easy, moderate and real difficult questions	10-12 min for SVV and no time frame for TVV	Knowledge and skill, students' perception	7.5% scored 51-100 marks in SVV to 0% in TVV	15.5
Ponnudhali D et al., 2016 [27]	I-year MBBS students	75	Molecular biology	Vinayaka Mission's Kirupananda Variyar Medical College, Salem, Tamil Nadu, India	Non randomised 2 group	Question sets with must know, should know and nice to know domains	5 min for SOE and TVV	Knowledge and skill, students' perception	Inter-rater and internal consistency reliability was positive (0.266) for SOE and negative (-0.172) for TVE	10.5

Bagga IS, et al., 2016 [28]	II-year MBBS students	74	Forensic Medicine	SHKM Govt. Medical College, Mewat, India Teerthanker Mahaveer Medical College, Moradabad, India ESIC Medical College, Faridabad, India	Single group pretest and post-test	Not mentioned	Not mentioned	Knowledge and skill, students' perception	Mean marks in SVE are 24.7 and 21.4 in TVE. 79% students felt SVE easier than TVE	12.5
D Souza UJ et al., 2016 [29]	I-year MBBS students	80	Integrated program included all basic science subjects	Universiti Malaysia Sabah, Malaysia	Non-randomised 2 group	Question sets	15 min for SOE and no time frame for COE	Students' perception	Learning objective well covered in SOE compared to COE	8
Bhadre R, et al., 2016 [30]	I-year MBBS students	42	Biochemistry	K.J.Somaiya Medical College, Mumbai, Maharashtra, India	Non-randomised 2 group	Questions with must know, desirable to know and nice to know areas	10 min for SVV and no time frame for TVV	Knowledge and skill, students' perception	Mean marks obtained in SVV is 6 and 5.2 in TVV	13.5
Waseem N and Iqbal K, 2016 [31]	I-year MBBS students	100	Anatomy	Al Nafees Medical College, Islamabad, Pakistan	Non-randomised 2 group	Question sets	Not mentioned	Knowledge and skill, students' perception	Mean viva marks in SV are 7.5 and in USV is 7, 30% of students felt questions were difficult and 70% felt questions were easy in USV, 100% felt mixture of easy and difficult in SV	14.5
Ganji KK, 2017 [14]	III year and IV-year BDS students	50	Periodontology	Al Jouf University, Saudi Arabia	Randomised controlled trail	Question sets on Bloom's taxonomy- knowledge, comprehension and application	10 min	Knowledge and skill	Mean marks in 3rd year – 7th day – 2.76 and 14th day – 3.76, 4th year – 7th day – 3 and 14th day – 3.92	12.5
Sule PA, et al., 2017 [15]	II-year MBBS students	62	Microbiology	Rajiv Gandhi Medical College, Thane, Maharashtra, India	Single group cross-sectional	Question set with recall and analytical type questions	7 min for SVV and time taken for TVV ranged 3-10 min	Knowledge and skill, students' perception	Mean marks obtained is 10.77 in TVV and 10.38 in SVV, but majority students felt SVV is better than TVV	13
Rokade SA and Kate MR, 2017 [16]	I-year MBBS students	52	Anatomy	Byramjee Jeejeebhoy Government Medical College, Pune, Maharashtra, India	Single group pretest and post-test	Question with must know, should know and nice to know domains	Not mentioned	Knowledge and skill, students' perception	73% students scored above 50 marks in CVE whereas 33% scored above 60-80 marks and 6% score above 80 marks in OSVE. OSVE had 95% sensitivity and 21% specificity	15.5
Patidar A and Chaturvedi JN, 2019 [17]	II-year MBBS students	79	Pharmacology	Govt. Shyam Shah Medical College, Rewa, Madhya Pradesh, India	Single group pretest and post-test	Question sets with must know, should know and nice to know domains	10-15 min for SOE and no time frame for COE	Knowledge and skill, students' perception	Mean marks obtained in SOE is 7.10 and in COE is 3.72, 79.75% agreed that SOE better to assess knowledge	13.5

[Table/Fig-3]: Data extraction sheet containing study characteristics [14-31].
SVV: Structured viva voce; OSVV: Objective structured viva voce; TVV:T raditional viva voce; CVV: Conventional viva voce: MCQ: Multiple choice question; USVV: Unstructured viva voce; TVV: Traditional viva exam; SVE: Structured viva exam; OSVE: Objective structured viva voce



[Table/Fig-4]: Forest plot showing pooled mean marks of conventional and structural oral examination.

16.6% of the articles in this review reported that mean viva voce marks in the SOE are less when compared to COE. The reason was that structuring exposes students to all types of questions from easy to difficult levels whereas traditional viva voce may make students answer several easy or several difficult level questions [16]. 78% of 1,311 students from all studies have reported that SOE covered a wide range of topics, was less stressful, not exhausting, and positively influenced the learning patterns. It has been suggested that structured viva voce examination can be improved by increasing the number of examiners. Although a moderate level of evidence has been reported according to the MERSQI scale, the feasibility and acceptability of a change in the formative assessment among the students and faculty for structured viva examinations have increased [17].

Limitation(s)

The limitation of this review was related to the MERSQI outcome domains. The scale is good for assessing evidence on effectiveness, but it makes no differentiation between knowledge and skills. Future work in this domain may develop this feature of the MERSQI scale. Also, the MERSQI scale does not consider the statistical power of the studies included, which is necessary to establish the levels of evidence in a well-organised manner. All the included articles have the limitation of being done the trial for the short-term and done on a single topic in a single specialty. High-quality studies with crossover randomised controlled trials comparing the conventional and structured oral examination will help to derive a more convincing inference.

CONCLUSION(S)

This review and meta-analysis showed no difference in the mean viva voce marks scored by the students in a COE and SOE. Though, there is general acceptability for structured viva voce, future research based on learning domains (cognitive, psychomotor, affective and communication) is needed to assess the effectiveness of structured viva voce in assessing the progress of learning.

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