WJMER

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BETTER EDUCATION. BETTER HEALTH.

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Introduction

The World Journal of Medical Education and Research (WJMER) (ISSN 2052-1715) is an online publication of the Doctors Academy Group of Educational Establishments. Published on a quarterly basis, the aim of the journal is to promote academia and research amongst members of the multi-disciplinary healthcare team including doctors, dentists, scientists, and students of these specialties from around the world. The principal objective of this journal is to encourage the aforementioned, from developing countries in particular, to publish their work. The journal intends to promote the healthy transfer of knowledge, opinions and expertise between those who have the benefit of cutting edge technology and those who need to innovate within their resource constraints. It is our hope that this will help to develop medical knowledge and to provide optimal clinical care in different settings. We envisage an incessant stream of information flowing along the channels that WJMER will create and that a surfeit of ideas will be gleaned from this process. We look forward to sharing these experiences with our readers in our editions. We are honoured to welcome you to WJMER.

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WELCOME

We are delighted to bring you the twenty-third edition of the World Journal of Medical Education and Research (WJMER). This edition assembles a variety of intellectually-stimulating articles and offers the reader an insight into the innovative research that is being conducted throughout the world.

The opening article by Hulail, Hassan, Tharwat and ElSawy considers the role of assessments in medical education, as well as their strengths and weaknesses. The article examines the purpose of assessments, the differences between formative and summative assignments, and how assessments have changed over time to consider skills such as independent learning, communication, team-work and problem-solving.

The second article by Al-Jasim, Al-Kubaisy and Al-Khafaji contemplates whether educating patients with diabetes mellitus could lead to a reduction in the prevalence of diabetic foot disease and the subsequent burden placed on global healthcare services. The article aims to establish the knowledge, attitudes and practices of patients with diabetes mellitus via the use of a questionnaire.

Chege evaluates the role of community-based medical education on the retention of doctors in rural areas of Sub-Saharan Africa and the choice of specialty in Kenyan-trained doctors. The study identifies a positive association between the medical school in which doctors are trained and their perception of the role of community-based medical education on choosing a specialty.

Acknowledging the difficulties associated with determining the most appropriate management of right iliac fossa pain, Rait et al. aim to guide the reader through its common causes, its associated signs and symptoms, and the most appropriate treatment options for a range of age groups.

In the fifth article, Kumar highlights the limitations associated with the apprentice model of medical teaching and the ethical considerations related to patients' refusal of treatment. Kumar ponders how patients' autonomy in the decision-making process can challenge traditional approaches to the delivery of healthcare.
Muthusamy, Reihani, Khan and Kumar emphasise the prevalence of ectopic pregnancies in the UK and their contribution to maternal mortality. In doing so, the authors seek to address the risk factors associated with ectopic pregnancies and the management options available for improving patients' outcomes.

In the final article, Enoch endeavours to ascertain the innate factors that predispose an individual to obesity and to suggest recommendations for its prevention. She concludes that education, behavioural changes and environmental approaches may be effective in promoting healthy lifestyle habits and in mitigating an obesogenic environment.

We sincerely hope that you find each article in this edition enlightening, instructive, and pleasing to read.

Ms Karen Au-Yeung
Editor

Ms Rebecca Williams
Associate Editor

Professor Stuart Enoch
Editor-in-Chief

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Current Trends of Assessments in Medical Education with Special References to Preferred Tools in Anatomy Examinations

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Abstract
The assessment is an essential aspect of medical education. It fosters and motivates student learning and provides them with the skills necessary to develop lifelong learning. It provides the Licensing bodies with the necessary information to certify the future practitioners, and to discriminate among candidates for advanced training. Assessment may be summative to make decisions about the student grade for a course or formative assessment which is a core contributor to learning itself and guides student teaching.
In the first half of the last century, assessment in medical education depended mainly on written and oral examinations. However, traditional assessment tools are poor in measuring skills such as independent learning, communication with patients, working as part of a health team and problem-solving skills. From the fifties of the last century, several new methods of assessment have been developed to measure all aspects of student competence. Multiple-choice questions (MCQs) had been widely used to test knowledge. The objective structured clinical examination (OSCE) was introduced to assess clinical skills. When the objectives of a medical course are changed, the assessment methods should reflect these changes.
All methods of assessment have strengths as well as limitations. The role of an assessment planner is to use different methods to maximize the benefits of such assessment.
The assessment method chosen should align with the nature of the knowledge, skills, or behaviors to be assessed. Medical institutions must strive to produce competent doctors to ensure optimal patient care.

Key Words
Assessments; Education; Anatomy; Examinations.

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Introduction

Assessment is the measurement of students progress in the educational process. It is an essential aspect of medical education as it fosters and motivates learning of students and helps them to accomplish the skills required for lifelong learning (Snyder, 1971; Bloxham and Boyd, 2007; Epstein, 2007).

If the assessment is conducted properly, it serves multiple purposes (Amin and Khoo, 2004; Newble, 1998). It determines whether the learning objectives are met, it supports the learning and certification processes of students and judges their competency. Moreover, it helps to evaluate the teaching programs to predict future performance. Certifying organizations perform assessments to ensure competence of future practitioners, to select candidates for advanced training, to motivate and direct the learning process and to evaluate the training programs (Epstein and Hundert, 2002).

It outlines the students' experience and behavior more than any other educational tool (Epstein, 2007; Bennett, 2011; O'Neill, 2014). Most students focus on acquiring knowledge and exhibiting skills that they expect to be the assessment requirements (Fransson, 1977).

Vleuten (1996) described that assessment guide the learning process through its frequency, timing, content, design or format regarding what is asked and the knowledge required.

The demands of the society had been changed so medical institutions must teach and assess their students in the most beneficial way to meet these changes (Shaughnessy and Pauline, 2015). It is seen as the single strongest determinant of what students actually learn (as opposed to what they are taught) and is considered to be a uniquely powerful tool for manipulating the whole education process (Stella, 1993).

Harden and Laidlaw (2012) stated that students may neglect bad teaching; however, they cannot behave in the same way with assessments if they seek certifications built on such assessments.

An integrated curriculum that does not incorporate equally integrated assessment strategies is ineffective in achieving the desired educational outcomes (David et al., 2017).

Principles of Assessment

Assessment is necessary of any educational program. The perfectness of an assessment tool is determined by its reliability, validity, fidelity, educational impact, feasibility and acceptability. Careful balanced cooperation between these five principles of assessment is required rather than focus on any one of them. The efficacy of assessment is the product of all five of these characters. For choosing an appropriate assessment tool, this conceptual model had to be considered (Vleuten, 1996; Norcini et al., 2011).

The validity of an assessment tool is the extent to which it measures what it is supposed to measure (Towle, 1991; Goetz et al., 1992; Atkinson et al., 1993; Pressley and McCormick, 1995; Vleuten, 1996; Messick, 1989; Downing, 2003). The assessment must contain a range of components to be assessed as behaviors, attitudes, skills and knowledge. Validity is the interpretation of assessment results rather than the assessment used (Messick, 1989; Downing, 2003).

Reliability is the reproducibility of assessment results over time at various instances. A reliable test should yield reproducible scores or at least a similar ranking of participants if they were retested (Goetz et al., 1992; Atkinson et al., 1993; Pressley and McCormick, 1995). Repetition of the test on the same group of students using the same assessment instrument should give the same results as the earlier scores. This is called the stability of test scores or test–retest reliability. The concept of reliability includes the ability of assessment tools to differentiate between students (ACGME, 2000; Downing 2004; AERA, APA, and NCME 2014).

Feasibility is concerned with the requirements of the assessment itself. Does it require unreasonable resources concerning its time, cost or staff to achieve it? Is the assessment tool is practical to run? Moreover, the cost of an assessment tool is an important criterion in the case of its widespread use in a medical school (Fowell et al., 2000).

Types of Assessments

There are two types of assessments. The first type of assessment is the assessment of learning, also known as the summative assessment. It is the traditional paradigm in formal education and determines student progression. It provides a summary of a student's learning progress to be used in making decisions about the student's completion of a course or achievement of a grade (Downing and Yudowsky, 2009). It is applied for validation and accreditation of the learner. However, it does not guide future success for both students and educators (Wiliam, 2011).

The second type of assessment is a formative assessment. It is assessment for learning and is a core contributor to learning itself. It guides student teaching (WHO, 2001; Tormey, 2015; Downing and Yudowsky, 2009). It is done in the classroom to evaluate student understanding. Teachers, learners, or their peers can interpret the results of these assessments to decide the next steps in teaching (Broadfoot et al., 2002; Black and Wiliam, 2009). It is performed mainly to enhance student learning by taking feedback on his performance. It is a tool used in medical education to identify the points of strength and weakness in students (Downing and Yudowsky, 2009).

Feedback from formative assessments had a significant effect on summative assessments for both students and teachers. Facing several settings of formative assessment markedly reduced students' fear of summative examinations. It also has an important role in promoting the teaching-learning processes (Begum et al., 2013). Unfortunately, medical educators depend mainly on summative assessment at the end of a course to test acquired knowledge. It becomes too late to correct student deficiencies (Ende, 1983).

Grading System

Different grading systems are used by medical schools. These systems include five-step letter (A, B, C, D, or F) grading based on the following numeric grading system: A Excellent 90 – 100, B Very Good 80 – 89, C Good 70 – 79, D Pass 60- 69, F Fail 59 and below, honors/pass/fail or P/F system (Kim, 2007).

Recently, there has been a tendency to move toward a pass/fail grading system in medical schools in the U.S., particularly in the first two years. This is based on the assumption that it will reduce stress and anxiety among students and improve their psychological status as it diminishes competitiveness and promotes cooperative learning (Robert et al., 2009). In a pass-fail grading system, students will focus on the learning, giving and gaining of feedback to and from their peers on course activities (Nolen, 2011; Kohen, 2011). Rohe et al. (2006) proposed that a pass-fail grading system reflects students'

respect, concern and accountability for their peers and patients. It might have positive consequences in the success of health care reprogramming and reform.

However, other medical schools assumed that a change from a traditional graded system to a pass/ fail system may lead to a decline in attendance of scheduled educational activities, academic performance and in United States Medical Licensing Examination (USMLE) Step 1 scores (Robins et al., 1995). There are also reports that the letter grading system is highly reliable and better than the P/F grading system with regard to acquisition of minimal competency requirements in bedside nursing education (Reznick et al., 1989; Andre, 2000). Ravelli and Wolfson (1999) concluded that it is better to categorize grades into four or five marks.

Standard References Setting

External standards are established as a norm and are used to distinguish between students who gain satisfactory knowledge and skills and those who do not have these minimal standards and consequently fail them. However, these standard depend on who settled them and the methods used (Norcini, 2003). However, in norm settled assessments, a predetermined percentage failure is determined. Students' scores in an exam are arranged on a sequential pattern and a pass mark is adjusted to provide the required percentage failure or success rates. Poor students can pass the exam despite not having the desired minimal standards. Conversely, an excellent way of subject teaching may have dramatic effects on the students' knowledge, but not be reflected in any improvement in the previously settled pass rate (Stella, 1993).

Methods of Assessment

Previously, in the first half of the last century, written assessments consisting of essay questions and oral examinations including clinical cases were the main methods of assessment used in medical education (Norcini, 2005).

From the fifties of last century onwards, new assessment tools were introduced to measure students' knowledege, clinical skills and competence. Knowledge was assessed by multiple-choice questions (MCQs). Clinical skills were assessed by structured clinical examination (OSCE). Projects and log books were applied to document practical skills and clinical case examinations (Cushing, 2000).

WHO (2001) advised that traditional methods of assessment are weak in measuring clinical and practical skills, ability of self learning, problem-solving skills, communication with patients or sharing in health team work. Furthermore, methods of assessment should be obvious and known to students at the beginning of the course and these methods should be changed if the objectives of a medical course are changed to reflect the newly settled changes.

Miller (1990) proposed a four-layered framework termed The Miller Pyramid to assess progression of knowledge and clinical skills. This Pyramid classifies clinical competence into four levels: Knows (at the base of the pyramid); Knows How; Shows How; and Does (at the apex of the pyramid) (Figure 1). During the learning process, the student progresses from 'Knows' at the base of the pyramid to 'Does' at its apex (Downing and Yudowsky, 2009).

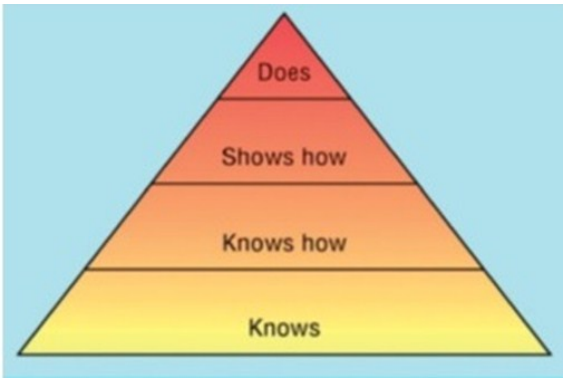

Figure 1: The Miller Pyramid for classification and assessment of clinical competence cited from Downing and Yudowsky (2009)

Assessment of 'Knows' and 'Knows How' of The Miller Pyramid can be done by long and short essay questions, oral examination, multiple-choice questions and extended matching items (EMI). 'Shows How' can be assessed by OSCE, long case and short case. 'Does' at the apex of The Miller Pyramid can be assessed by Mini Clinical Evaluation Exercises (Mini-CEX), Direct Observation of Procedural Skills (DOPS), Checklist, 360-Degree Evaluation, Logbooks and Portfolios (Zubair et al., 2006).

Miller's pyramid simulated a condensed form of Bloom's taxonomy (Bloom, 1984). Its lower two levels correspond to the six categories of the cognitive domain of the taxonomy. These domains in sequence are knowledge, comprehension, application, analysis, synthesis and evaluation/ judgement.

Bloom (1956) proposed a theoretical framework; Bloom's Taxonomy, to organize and classify learning objectives and their assessment of higher education. The taxonomy divides these objectives into 3 domains; cognitive (knowledge based), psychomotor (skills) and affective (attitudinal). Bloom described a graded six levels of domains to categorize the

cognitive level. These are remembering, understanding, applying, analyzing, evaluating, and creating (Bloom et al., 1956; Allen and Tanner, 2002, 2007).

These levels resemble a stairway, allowing teachers to promote their students to reach to a higher level of cognition throughout the anatomy course. Moreover, at any advanced level of these domains, a student can also revise the material at a previous one (Ramalingam et al., 2014). Bruce et al. (2015) stated that the level of complexity of assessment can be graded by Bloom's taxonomy (Figure 2).

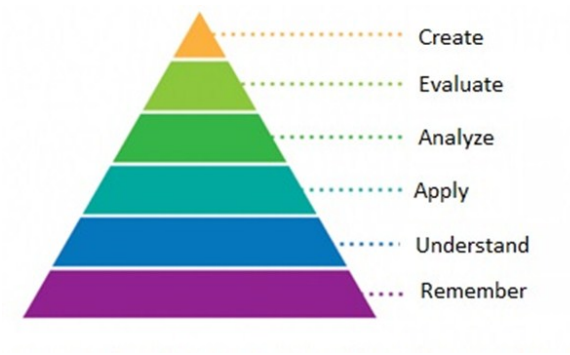

Figure 2: Bloom's Taxonomy, cited from Bloom et al. (1956)

Oral examination in which one or more examiners ask a student questions in a face-to-face meeting detects the ability of the student to recall and synthesize knowledge (Zubair et al., 2006). It can be used in assessment of critical thinking, application of knowledge and it evaluates self-confidence and assurance (Memon et al., 2010). Its validity, however, depends to a great extent on the examiners (Wenzel and Kirkevang, 2004; Sadaf et al., 2012). Its validity can be increased by selecting the content area with proper design of a marking scheme (Zubair et al., 2006). Lack of standardization of questions leads to high inter-rater variability and marking inconsistency. It is also poor in assessment of higher order knowledge such as problem solving and tends to test factual knowledge (Zubair et al., 2006; Tabish, 2008). Oral assessments or vivas should not be used in high stakes examinations such as judging borderline candidates or in summative assessments owing to its poor reliability (Muzzin and Hart, 1985; Wass et al., 2001).

Multiple-choice questions (MCQs) became widely used in the assessment of both undergraduate and postgraduate medical examination (Shumway and Harden, 2003). They are cost effective, good discriminatory tool and have a high reliability (AlRukban, 2006). They can be used to assess the ability to recall knowledge and clinical skills (Epstein, 2007). They have a large number of included items so can be used to assess a wide range of content. Consequently, MCQs are suitable for summative examinations so are used in national licensing tests (Epstein, 2007; van der Vleuten, 2000). The multiple choice question is a reproducible tool for assessment of knowledge but it is less valuable in evaluation of clinical skills. However, it is difficult to write perfect MCQs as they require experience and it is time-consuming and costly process (Epstein, 2007; Shumway and Harden, 2003).

Written examination is the most famous assessment tool used in medical education. It has a significant role on how and what students study and learn (Vleuten, 1996). It includes long or short essays questions (Schuwirth and Vleuten, 2004). Long essay questions are used to assess complex learning subjects that are difficult to assess by other tools (Tabish, 2008). They are beneficial in assessing students' ability to summarize and apply known knowledge to new situations (Schuwirth and Vleuten, 2003).

The short essay questions are open ended questions also termed Modified Essay or Constructed Response Questions (CRQ). They have a better coverage area compared to long essay questions and can be used in the assessment of clinical skills (Tabish, 2008). They facilitate assessment of student creativity and critical thinking. The student has to write the required answers rather than to select it as in MCQs. However, they are more time-consuming than MCQs and have a lower reliability, making them unsuitable for broad sampling (Schuwirth and Vleuten, 2003).

The Modified Essay Question (MEQ) is suitable for the assessment of one's problem-solving ability as the latter is one of the most difficult skills to be properly evaluated (Marshall, 1977; Rabinowitz, 1987). An essay carries the risk of considerable variation in marking and is time-consuming to mark (Wood, 2003). Multiple markers can be used to mark essay questions either short or long to gain good accuracy (Downing, 1992). A detailed answer key for the person marking the paper should be included in essay questions (Gronlund, 2006).

Two methods of scoring are used when marking essay questions. These are the analytic (point-scoring) or global scoring methods. The analytic method uses a model answer that is formerly prepared and the answers required are divided into several parts with marks assigned to each part. The use of multiple markers improves the reliability. Unlike the analytic method, global scoring requires the examiner to read the whole essay and make a judgment about its quality in the form of a letter (e.g. A to E) or Likert scale-type (e.g. fail, borderline fail, fair, good, excellent). The analytic method is

more useful in focused essay questions (Rita and Singh, 2012).

Key feature questions were firstly suggested by Bordage and Page (1987) to assess practical skills and patient solving problems in clinical exams instead of written assessments (Bordage and Page, 1987). A clinical problem is presented followed by several questions that require a written answer or by selecting the best of several possible choices.

It resembles real patient problem and facilitates learning of clinical skills and their related clinical case-based solving**.** It is used to assess both undergraduate and post-graduate students particulary in high stakes examinations as it helps stakholders to evaluate problem solving ability, skills of decision-making as well as practical procedural knowledge. If properly constructed it is feasible, highly reliabile and has a broad content validity (Page et al., 1995; Ali and Bordage, 1995; Trudel, 2008). Health educators are interested by key features question**s** over the last decade (Farmer and Page, 2005). It is widly used internationally in assessment medical education (Bordage and Page, 1987; Khan and Aljarallah, 2011; Wallerstedt et al., 2012).

Anatomy assessment despite integrated, could accurately evaluate the students' anatomy knowledge if the assessment tasks are planned for a deep learning approach (Logan and Marskak, 2011). Therefore, direct questions that aim at knowledge regurgitation, students are more associated with surface approach of learning. However, questions designed to conduct and organise knowledge (relational thinking), before applying and synthesising that knowledge into context (elaborated thinking), students in these cases are more likely to adopt deep approaches to learning (Smith et al., 2014; Vorstenbosch et al., 2014)

Extended Matching questions can be used to evaluate clinical scenarios provided that long option list are constructed to avoid cueing. It is a suitable assessment tool that can replace MCQ in basic and clinical sciences as it has less cueing (Tabish, 2008).

True or false questions are easy to write and can assess a broad areas of knowledge however it is difficult to construct properly. Also, they are poor as a discriminatory tool between different students. Their use in medical education becomes questioned (Chandratilake et al., 2011).

The Objective Structured Clinical Examination (OSCE) is an assessment tool firstly described by Harden et al. (1975). It is composed of several stations to assess student performance, clinical and practical skills. The stations may include real or standardized patients, simulators of procedures, answering clinical notes or interpreting laboratory data in writing format (Harden and Gleeson, 1979; Collins and Harden, 1998; Downing, 2004; Downing and Yudkowsky, 2009). It could be used to assess clinical skills as patient history-taking, knowledge depth, ability to search for a diagnosis and designing management plan. Communication with the patients and their relatives also could be evaluated (Regehr et al., 1998; Swartz et al., 1999).

Students pass through several stations changing from station to another in sequence (Harden and Gleeson, 1979). The duration of each station ranges from five to thirty minutes according to the type of the exam. Assessment of wide range of skills requires short-timed station. While examining clinical skills or patient-case solving requires relatively long-timed stations (Epstein, 2007; Downing and Yudkowsky, 2009).

The reliability of OSCE depends on its wide sampling (Reznick et al., 1993; Norman, 2002). The greater the number of stations in the OSCE, the greater its reliability and content validity are (Norman, 2002). A greater number of stations permit a wide sampling of the clinical and patient care skills to be assessed. The student has to pass through a minimum of 10 stations over the course of 3–4 hours to achieve minimal reliability and generalizability in OSCE stations (Downing, 2004; Downing and Yudkowsky, 2009).

It is accepted that an OSCE with about 20 stations allows the minimal required reliability (ACGME, 2000; Van der Vleuten and Swanson, 1990). If the time for its station is too short its validity might be lost (Wass et al., 2001).

Participation of students in an OSCE examination promotes their learning ability and clinical skills acquisition helping them at the subsequent exams (Carraccio and Englander, 2000).

The disadvantages of OSCE format include that its preparing is expensive and costly (Cusimano et al., 1994). Using real patients is difficult and disturbing as history taking is repeatedly done by the same asked questions (Yudkowsky, 2002). It has no benefit in the assessment of practical skills, management and follow-up of patient care or dealing with life-threatening conditions (Shannon and Norman, 1995).

Long case assessment is composed of examination of a real patient by the student at about 30–45 minutes uninterrupted and unobserved. The student presents his/her observed findings to the examiners

who examine the student orally about the patient case and the management plane. Traditionally students are examined in a single case by one or two examiners. It should not be used in summative assessment especially in high stake situations as its generalizability is limited and the reproducibility of its score is 0.39 meaning that actual student performance is responsible for 39% of the variability, however measurement error accounts for 61% of the score variability (Noricini, 2002). However variations among long clinical cases are reflected in students' scores more than variations between the examiners themselves (Wilkinson, 2008). For these reasons assessment in long cases become largely prohibited in western countries (Norcini, 2002; Tabish, 2014).

Short Case includes assessment in 3 or 4 real clinical cases by one to two examiners (Noricini, 2002). They promote discrimination between students' performance either good or poor than in long cases (Hijazi et al., 2002).

It gives the opportunity of assessment with real patients and has a wider sampling range than the assessment in single long case. It enhances assessment of clinical skills. Its validity is good. However, its reliability is poor and associated with inter-rater variability (Noricini, 2002; Zubair et al., 2006).

Mini Clinical Examination (Mini-CEX) is an assessment tool can be carried out in any healthcare center. An examiner evaluates a student–patient meeting. This meeting is about 15 minutes during which the student is expected to perform history-taking and clinical examination and then presents her/his diagnosis and treatment plan to the examiner (Norcini, 2003). The student performance is marked by a structured scheme and educational feedback is provided. Mini-CEX is a useful tool for assessment of residents in workplace. Six patient-meetings assessed by different examiner for each meeting during the year representing from different clinical problem well chosen from a list of clinical problems (Norcini, 2003). However, it has the same reliability as structured examinations using standardized patients (Vleuten et al., 2010). Four Mini-CEX assessments in the same context are adequate to achieve sufficient reliability. However, it may be difficult to get faculty members to accomplish that in one year. Another disadvantage of the Mini-CEX is that the observations are task- and content-specific (Norcini et al., 2003).

DOPS is a variety of the mini-CEX in which an examiner demonstrates the student performance while doing a practical procedure as venipuncture, giving an intravenous or intramuscular injection or measuring the blood pressure. The examiner then evaluates the student performance and provides feedback. Six observed encounters as in mini-CEX should be done by the student at the year. Each of these encounters is selected from a previously approved list and done with a different assessor. Generally, four to eight encounters give a satisfactory evidence regarding student performance (Norcini and Mckinley, 2007).

The portfolio is a framework that contains an evidence of accomplished learning outcomes over time. It used by educational organizations to document student learning progress for both formative and summative assessment (Davis et al., 2001). Royal College of General Practitioners, it introduced this tool of assessment in 1993 (Snadden, 1999; Buckley et al., 2009). It reflects what has been learned (Rees, 2005). It typically contains written documents, video or audio recordings, photographs and multimedia, and can be maintained in an electronic format. Its contents included personal experiences, learning process, documentation, certificates, and future goals regarding learning and its environments. Portfolio is closely related to self-directed learning and is most beneficial in evaluating gained competences such as improvement of practical skills and scientific base and profession in patient care (Snadden, 1999; Buckley et al., 2009).

Reliability of portfolios depends on well settled standards and criteria for its contents. Also, it is enhanced by incorporating evidence from a number of sources (Friedman et al., 2001).

Logbooks, like portfolios, document the student's experiences. However, they are usually more limited in scope than portfolios and are focused on data collected in a specific area or activity. At least three kinds of logs have been documented; procedural, operative and case logs (ACGME, 2000). Procedural logs usually document how many and when procedures were performed by the learner. Operative logs are similar but document what was done and when. Logbooks are limited in their assessment powers (ACGME, 2000).

Checklist Evaluation

Checklists include the desired behavior, practical activities or clinical skills that are required to be main characters of learner attitude. Typical criteria include completeness of the work and proper follow-up for correction of the mistakes occurred while performing it. Standards of performance are required to be settled as a guide for evaluation of optimal performance (ACGME, 2000).

Multisource or 360-Degree Assessments

These are measurement tools performed by several people in a person's work habits, capacity for teamwork, interpersonal behaviors (Ramsey et al., 1993; Violato et al., 1997). Evaluators include personal peers, clinical team members or patients. To be effective multisource feedback must give feedback including descriptive comments, statistical data, good monitoring and follow-up. This tool of assessments has a good impact on future academic and clinical performance. However, it is challenging to conduct it with large numbers of evaluators to gather reports regarding students/resident's performance though it may be feasible using an electronic system (Norcini, 2003).

Choosing Assessment Method

Traditional medical education focused on acquiring essential knowledge on each topic. Recently more attention is given to the practical and clinical skills and attitudes in a future good doctor (GMCC, 1980; Towle, 1991). The traditional summative assessment has a great benefit in the early years of medical school as basic knowledge is the core of the curriculum, there are different methods of assessment in the anatomy curriculum. They range from written examinations to practical evaluations such as spotter tests and oral-based assessments such as viva voce (Vorstenbosch et al., 2014). The written component of an anatomy examination usually involves MCQs (consisting of one stem and up to five distractors with one best answer), EMQs (consisting of short cases called vignettes (Wood, 2003), a number of distractors and one best answer for each stem) or short-answer questions (SAQs). However, in the later years medical educators try to promote critical thinking and clinical skills required for future physician the traditional summative assessment is lacking. Medical schools had incorporated more formative forms of assessment to shift from wrote learning to high quality more engaging integrated learning (Ferris and Flynn, 2015).

There is no single assessment tool can assess the wide range of knowledge and skills required for the future physician. Medical examiners should identify the aspects that they wish to test and then provide a range of appropriate tools (Roberts and Norman, 1990). All assessment tools have strengths in some aspects and limitations in others. The assessment manager has to use different tools to gain a maximal benefit from such an assessment (Epstein, 2007). The assessment planner should address six key questions; why is the assessment is to be done, what subjects are to be assessed, how and by any tool, when, where and who (Harden and Laidlaw, 2012). Three major characters of assessment must be taken in mind during choosing an assessment tool. Firstly, the content of the assessment should be proportionally represented and organized a process known as blueprinting (Raymond and Neustel, 2006). Secondly the validity, reliability of the assessment method to be used. Thirdly the circumstances at which the assessment will be carried out (Kern et al., 1998; Norman, 2006).

The chosen assessment tool must coincide perfectly with the type of knowledge, nature of skills, or behaviors to be assessed (Norman, 2006).

MCQs, EMQs and essay questions can assess and are beneficial in assessment of knowledge. Traditional methods including assessment in long and short cases can be used in assessment of practical and clinical skill. Moreover, newer methods as OSCE (objective-structured clinical examinations) mini-CEX and portfolios can be used in assessment and evaluation of practical and clinical skills (Sood and Singh, 2012). Competency as professionalism, communication skills, attitude, teamwork ability are difficult to evaluate (Epstein, 2007; Roberts and Norman, 1990).

The test content is organized by the blueprinting process through which the test questions have to proportionally represent the content areas of knowledge or behaviors to be tested (Linn, 2006). Though it is difficult to assess everything using a carefully constructed blueprint ensures sufficient and appropriate sampling of all knowledge and skills students are expected to know (Hamdy, 2006).

In the traditional curriculum, anatomy had its own place in assessment, and students had to sit through all three forms of assessment (written, practical and oral). In fact, prior to 2005, medical students were assessed more often by practical (94.2% v. 33.3%) and oral (84.5% v. 13.1%) methods and less often by written methods (25.2% v. 68.7%) when compared with graduates' post 2005 (Rowland et al., 2011). However, despite being used for a considerable amount of time in medical education, the practical spotter tests have been criticized for testing low levels of knowledge in students (Yaqinuddin et al., 2013). Thus, in the modern curriculum, spotter examinations have been eliminated in most institutions (Smith and McManus, 2015).

Although anatomy assessment in the modern curriculum is integrated, it can still function as a reliable tool for demonstrating students' anatomy knowledge if the assessment tasks are designed to foster a deep approach to learning (Logan and Marskak, 2011). Hence, if questions are primarily aimed at knowledge regurgitation, students are

more likely to employ surface approaches to learning.

Defining the purpose of the assessment either high or low stakes help to determine the number of the samples needed. The higher the stakes, the more samples are required in the assessment (Downing, 2003).

Challenges of Assessments

MCQs are difficult to write and can result in cueing, essay questions can have high interrater reliability, oral examinations are subjective and may have sex and race unfairness and simulators are expensive and present artificial settings. To overcome these challenges, multimodal assessment can be used to provide broader insights into trainee competence and allows input from a number of assessors of the student's performance (Holmboe et al., 2010).

Educators tend to assess what is easy, rather than assessing what is important. On the other hand, excessive variability in ratings by different raters has raised concerns about reliability and validity (Gingerich et al., 2011). All measurements have error (Downing, 2003).

The quality of patient care is directly linked with a clinician's attitude (CQHCA, 2001). Poor academic quality often results in deficient clinical care despite the underlying individual's level of experience (Hamilton and Pinnegar, 2000). Medical institutions must strive to produce competent doctors to ensure optimal patient care (Shaughnessy and Pauline, 2015). However, the assessment in medicine is greatly challenging due to combination of increasing cohort sizes and shrinking budgets (Fottrell, 2006; Gibbs, 2006).

Recently medical migration occurred worldwide with greater tendency towards more rich and comfortable countries. Comparison of students and clinicians from different medical educational backgrounds to select for training posts or employee became more difficult (Bidwell et al., 2013; Chen and Boufford, 2005).

Conclusion

Assessment is of two types. Summative assessment determines student progression and to provide a summary of a student's performance to be used to make decisions about the student grade and validation and accreditation purposes. Formative assessment is a core contributor to learning itself. It guides student learning and gives an evidence of where the student is at the course and using this evidence can be used by teacher to make decisions about the next steps in instruction and had a significant effect on summative assessment in various aspects. No single examination tool can be used to assess the wide range of knowledge and skills required for the future physician. Medical examiners should identify the aspects that they wish to test and then provide a range of appropriate tools. The content of the assessment should be proportionally represented and organized a process known as blueprinting. The chosen assessment tool must coincide perfectly with the type of knowledge, nature of skills, or behaviors to be assessed. MCQs, EMQs and essay questions can assess and are beneficial in assessment of knowledge. Traditional methods including assessment in long and short cases can be used in assessment of practical and clinical skill. Moreover, newer methods as OSCE (objective-structured clinical examinations) mini-CEX and portfolios can be used in assessment and evaluation of practical and clinical skills. Competency as professionalism, communication skills, attitude, teamwork ability are difficult to evaluate. The test content is organized by the blueprinting process through which the test questions have to proportionally represent the content areas of knowledge or behaviors to be tested.

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Conflicts of Interest

The authors declare there is no conflicts of interest.

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Knowledge, Attitude and Practices of Diabetic Foot Patients Admitted to the Surgical Wards at Baghdad Teaching Hospital: A Cross-Sectional Study

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Abstract
Background: Diabetic foot disease is a common complication of Diabetes Mellitus (DM). It forms a huge burden on the surgical wards worldwide, yet it can be prevented extensively by patients with appropriate level of knowledge, attitudes and practices towards their diabetes.
Methods: A structured questionnaire was developed to assess the knowledge, attitudes and practices towards the prevention of DM and diabetic foot disease. The questionnaire scores were compared with similar studies and with the study sample itself. A total of 77 patients were included in the study.
Results: 58% of patients were males. Only 27% had finished secondary school education. 27% presented with diabetic foot complications for the first time. The mean total score of the sample was 28.4 ± 5.8 out of a possible total of 44. People with secondary school education and those suffering from DM for more that 15 years had better questionnaire scores overall. Higher knowledge of DM and diabetic foot disease were weakly correlated with attitudes and practices for those two diseases, respectively.
Conclusions: The weak association between scores of knowledge, attitudes and practices can be attributed mainly to poor compliance. A large number of subjects failed to translate their knowledge into actual attitudes and practices for ultimate prevention.

Key Words
Diabetes mellitus; Diabetic foot disease; Prevention; Knowledge; Practices.

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Introduction

Background

Diabetes Mellitus (DM) is a chronic metabolic disorder affecting all organ systems in the body, forming a serious burden on health care systems worldwide. According to WHO, more than 422 million people were known to have DM worldwide back in 2014, and it is estimated that about 590 million people worldwide will have the disease by 2035[1]. The global prevalence of DM among adults over 18 years old has risen from 4.7% in 1980 to 8.5% in 2014[2]. While in Iraq it has risen from 5% in 1978 to 19.7% in 2012[3]. According to Iraqi Diabetes Federation in 2017, prevalence of adult diabetes in Iraq was 7.6%[4].

DM can cause cumulative damage to the nerves and vasculatures, particularly those of the legs and feet in the form of diabetic vascular disease which has three known components: arteritis and small-vessel thrombosis, neuropathy and large vessel atherosclerosis. Wound healing is also impaired due to affected collagen synthesis[5]. Patients with diabetic neuropathy have diminished or no sensation and therefore might be unaware of any trauma to their feet. Additionally, DM causes immunosuppression facilitating wound/ulcer infection.

All of the abovementioned conditions predispose patients with DM to develop diabetic foot disease (DFD)[6]. The risk of foot ulceration varies with the number of risk factors. There is a 1.7 higher risk in patients with isolated peripheral neuropathy, 12 times higher risk in patients with peripheral neuropathy and foot deformity, and 26 times higher risk in those with peripheral neuropathy, deformity and previous amputation, as compared with DM patients without risk factors[7]. Qualitative studies have confirmed clinical observations in that diabetic foot ulcers have negative physical and psychosocial effects influencing the quality of life[8]. DFD is among the most prevalent complications of DM. Foot ulcers affect about 10 to 20% of diabetic patients at least once during their lifetime[9]. Some studies estimate that 5% of DFD patients will undergo amputation at some point in their life[10]. From the 159 million people who have diabetic foot disease, 20.5 million YLDs (Years Lived with Disability)

(2.6% of total global YLD) are attributable to diabetic foot problems. Compared to other conditions causing YLD, diabetic foot disease ranks in the top 10 causes of YLD and morbidity worldwide[11]. Given that the patient is the primary foot carer, education is a key element in successful management of diabetes and DFD. Knowledge about different aspects of this disease empowers patients to play an active role in effective diabetes self-management and self-foot-care[12].

DFD imposes a major economic burden. The average annual expenditure on the management of diabetic foot diseases in the US is $8659/Patient, with a total economic burden ranging from 9 to 13 billion dollars in addition to the costs for diabetes management[13]. Primary prevention has a 90% likelihood of providing cost-savings when annual prevention costs are less than $50/person and/or annual DFU incidence is reduced by at least 25%. Efforts directed at patients with diabetes who were at moderate or high risk for DFUs were very likely to provide cost-savings if DFU incidence was decreased by at least 10% and/or the cost was less than $150 per person per year[14].

This article aims to assess the level of knowledge, attitudes and practices of diabetic foot patients to their disease using a structured questionnaire specifically developed for that purpose, and attempt to establish any correlations or differences in these parameters based on demographic and educational data and disease profiles of the patients.

Material and Methods

Study Design

This cross-sectional study was conducted among patients with type 1 and 2 diabetes in Baghdad Teaching Hospital, Baghdad, Iraq. Patients who were admitted to the surgical wards for debridement, amputation or follow up of their diabetic foot problems were conveniently selected for participation after acquiring their verbal consent. All patients who consented and who were a known case of DM with diabetic foot problems were included in this study. Patients who were unable to hold an interview (unconscious, psychotic and mentally challenged) and those who have been diagnosed with DM on the current admission were excluded from the study. The overall response rate was 91%.

Study Questionnaire

A structured questionnaire was employed to evaluate the participants' knowledge, attitudes and practices towards both their diabetes and diabetic foot complications. The questionnaire was built after reviewing the literature and adopting items from different questionnaires used in relevant studies[15, 16, 17, 18, 19].

The questionnaire encompasses seven sections in the following sequence: demographic data, clinical profile, general knowledge about DM, preventive and curative attitudes and practices towards DM, general knowledge of diabetic foot disease, preventive and curative attitudes and practices towards diabetic foot disease and education concerning DM and diabetic foot disease.

For the general knowledge sections as well as the education section, "Yes" or "No" were the only acceptable answers, while for the attitudes and practices sections, "Yes", "Sometimes" and "No" were accepted.

Two- and three-level Likert scales were used to grade participants' responses and establish a "total score" for each section as well as an overall total score on the following basis:

'Yes' = 1 point
'Sometimes' = 0.5 points
'No' = 0 points

The overall total score was calculated by summing up the scores of the four knowledge and attitudes and practices sections. The education section's score was not used in this calculation given that it does not reflect an intrinsic knowledge or behavior (not the patient's own educational level) but rather represents the influence of outside factors on the patient's education (i.e.; health care provider and media education).

A pilot study was conducted to examine the effectiveness and practicality of the structured questionnaire and scoring method, which retained scientific desirable results. The questionnaire was approved by the Department of Community and Family Medicine at the College of Medicine, University of Baghdad.

2.3 Data Collection

Data was collected through direct interview with the patients, and their answers were ticked by the researchers after comparing them to fixed operational definitions to ensure unbiased documentation.

2.4 Ethical Consideration

All participants received a brief explanation of the goal, methods and value of the study before being asked for their verbal consent. Human subjects' names along with an identification code for each

participant were saved on a separate spread sheet that is password-protected and only accessible to the investigators. Identification codes were used instead of names and personal data during the data analysis process.

2.5 Statistical Analysis

Data entry and analysis was conducted using the Statistical Package for Social Sciences (SPSS) software (v.24.0). Descriptive statistics were presented as means, standard deviations, frequencies and relative frequencies. Independent Samples T Test, Pearson's correlation coefficient and Fisher's exact test were used for statistical analysis as appropriate. The chosen level of significance was 0.05 throughout the analysis.

Results

3.1 Sociodemographic Data

Of the 77 individuals included in the study, 58.4% were males and 41.6% were females. 87.5% of females were unemployed housewives, while 26.6% of males were unemployed or retired. The mean age was 54.9 ± 9.7 years. 96% of the sample were residents of urban areas in Baghdad. Only 27.3% finished their secondary school education while the majority were either primary school educated or illiterate. 92% were married.

3.2 Clinical Profile

71.4% of the sample had suffered from previous DFD prior to the current admission. As for co-morbidities, 59.7% of patients claimed to be hypertensive, and 33.8% claimed to have dyslipidemia. 26% of patients were smokers, with a rate of 37.6 ± 33 pack-years.

3.3 Questionnaire Scores

Table 1: The sample's score in each section (mean score ± SD) compared to the maximum possible score of said section.

Section	Mean Score ± SD	Max. Possible Score
DM Knowledge	16.3 ± 3.6	23
Attitudes and Practices towards DM	4.4 ± 1.1	7
Diabetic Foot Disease Knowledge	4.4 ± 1.5	7
Attitudes and Practices Towards Diabetic Foot Disease	3.2 ± 1.4	7
DM and Diabetic Foot Education	3.1 ± 0.9	5
Overall Total Score	28.4 ± 5.8	44

For the "Diabetes mellitus and diabetic foot education" section of the questionnaire, 81.8% of the sample said they had received foot-care education from a healthcare provider, while only 40.3% of them said they had received medical education about their conditions from the media. Table 2 summarizes patients' responses.

Table 2: Patients' responses to the "DM and diabetic foot education" section.

Sample Score = 3.1 ± 0.9 (Max. score = 5)				
Questionnaire Item	Response			
	Yes		No	
	N	%	N	%
Has the patient ever				
received dietary advice from a doctor?	75	97.4	2	2.6
received foot-care advice from a healthcare provider?	63	81.8	14	18.2
panicked when receiving advice about DM and diabetic foot?	37	48.1	40	51.9
received education about DM and diabetic foot from media outlets?	31	40.3	46	59.7
received a brochure about foot-care for diabetic patients?	35	45.5	42	54.5

For the ease of comparison with other studies, each section's scores were divided into three equal class intervals (poor, moderate and good). The scoring distribution for this sample according to these categories can be seen in figure 1.

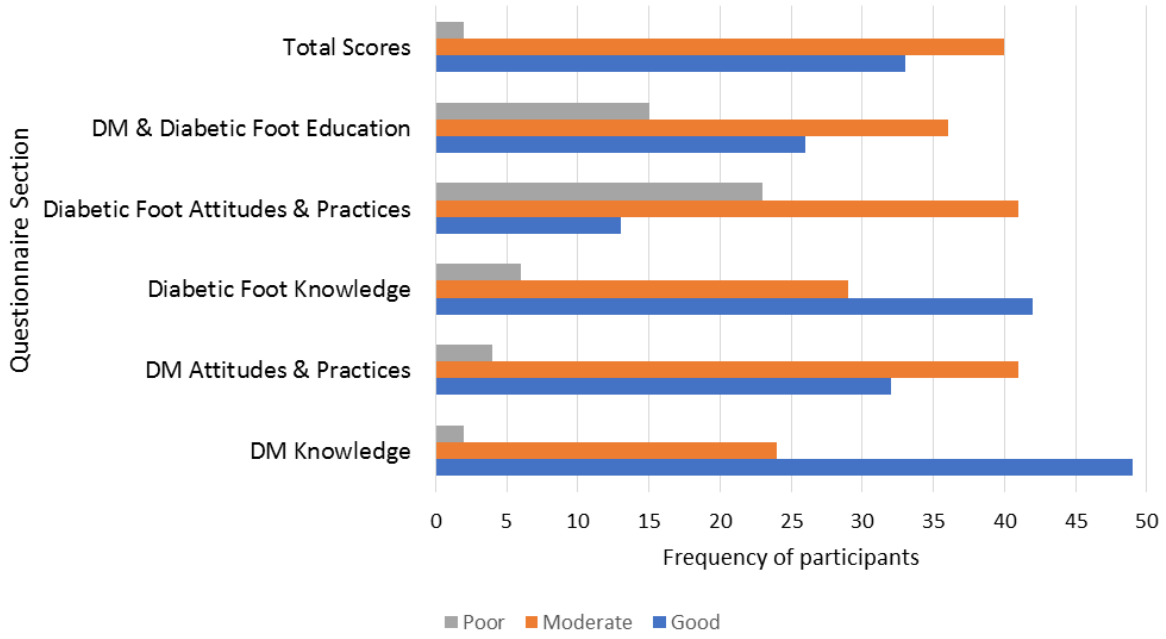

Figure 1: Scoring categories for each section of the questionnaire.

There was a statistically significant correlation between knowledge scores and attitudes and practices scores for both DM (r = 0.39, p-value = 0.001) and DFD (r = 0.395, p-value < 0.001) demonstrated in figure 2.

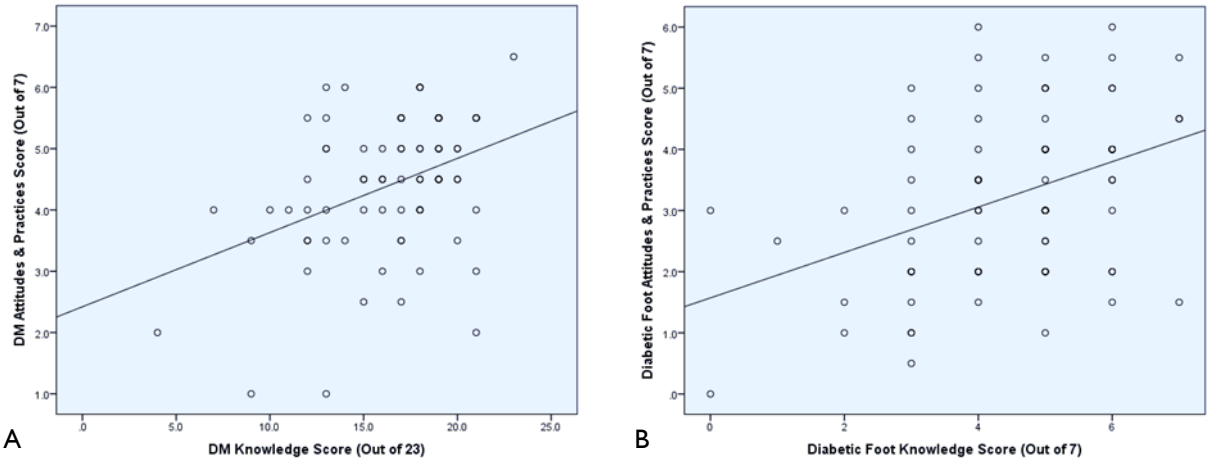

Figure 2: Positive, statistically significant correlation between DM knowledge scores and DM attitudes and practices scores (r = 0.39, p-value = 0.001). B: Positive, statistically significant correlation between diabetic foot knowledge scores and diabetic foot attitudes and practices scores (r = 0.395, p-value < 0.001).

There was a statistically significant difference between those who finished their secondary school education and those who did not in all questionnaire sections except the DM and DFD education as shown in table 3.

Table 3: The difference in questionnaire scores between those with and without a secondary school degree. (Independent samples T-test; level of significance = 0.05). Bolded rows indicate significant findings.

Score	Secondary School Degree (Mean ± SD)		T	df	p (2-tailed)
	With	Without			
DM knowledge score	***17.7 ± 1.9***	***15.7 ± 4***	***2.9***	***69.5***	***0.005***
DM attitudes and practices score	***5.0 ± 0.7***	***4.2 ± 1.2***	***4.0***	***59.6***	***0.000***
Diabetic foot knowledge	***4.9 ± 0.9***	***4.2 ± 1.6***	***2.1***	***61.1***	***0.037***
Diabetic foot attitudes and practices	***3.8 ± 1.4***	***3.0 ± 1.3***	***2.2***	***75***	***0.028***
DM and diabetic foot education	*3.1 ± 0.9*	*3.2 ± 1.0*	*-0.5*	*75*	*0.650*
Total	***31.5 ± 3.2***	***27.2 ± 6.2***	***3.9***	***67.5***	***0.000***

There was a statistically significant difference among those who have been diagnosed with DM for over 15 and those who have been diagnosed less than 15 years ago in terms of DFD sections and total questionnaire score as shown in table 4.

Table 4: The difference in questionnaire scores between those who have been diagnosed with DM for 15 years or less and those who have been diagnosed more than 15 years ago. Independent Samples T Test. Bolded rows indicate significant findings.

Score	Mean ± SD Duration since DM diagnosis		T	df	p (2-tailed)
	> 15 years	≤ 15 years			
DM knowledge	*17.1 ± 2.7*	*15.9 ± 4*	*1.3*	*66.5*	*0.136*
DM attitudes and practices	*4.5 ± 1.1*	*4.4 ± 1.2*	*0.3*	*75*	*0.761*
Diabetic foot knowledge	***5.0 ± 1.3***	***4.2 ± 1.5***	***2.3***	***75***	***0.022***
Diabetic foot attitudes and practices	***3.7 ± 1.3***	***3.0 ± 1.4***	***2.4***	***75***	***0.019***
DM and diabetic foot education	***3.5 ± 0.8***	***2.9 ± 1.0***	***2.4***	***75***	***0.018***
Total	***30.3 ± 4.5***	***27.4 ± 6.2***	***2.1***	***73***	***0.040***

Discussion

4.1 Knowledge and Its Effect on Attitudes and Practices

The study has shown that the sample had good knowledge scores, yet lower attitudes and practices scores in terms of DFD (table 1), hinting that patients already had certain level of knowledge of foot care but the practice of that particular knowledge was not always carried out. For example; patients were still smoking despite their knowledge of its negative effect on their DFD. This could be a reflection of negligence and poor compliance and it is consistent with other similar studies[20,21].

4.2 Level of Education

This study highlights the statistically significant association between level of education and patients' general knowledge about DM and DFD. It shows the least educated people tend to have least knowledge. Such demographic might be considered for targeted counseling and education. This finding is consistent with another study reported in the literature[22]. The significant association between level of education and DM and DFD attitudes and practices shows that the more educated the patient, the better attitudes and practices towards their own disease and contrariwise. This result is supported by the positive correlation between

knowledge and attitudes and practices scores as mentioned above.

The significant association between level of education and total questionnaire scores is not surprising. As the patients with higher education, good knowledge (as evident in the results), well adherence to preventive attitudes and practices (as explained thoroughly) will surely have better total scores than the less educated group.

4.3 Duration Since DM Diagnosis

The fact that diabetic foot complications are more disturbing than diabetes itself (more symptomatic and causes more disability and inconvenience to the patient) is a good motivational factor to drive the patient attention towards practicing good foot care in an attempt to end the suffering. That could explain the statistically significant difference among those who have been diagnosed with DM for 15 years or more and those who have been diagnosed for less than 15 years in terms of DFD sections and total questionnaire score.

4.4 Means of Educating Diabetic Foot Patients

The study sample's responses on the individual education items (table 2) reveals that while 97% had received dietary advice and 82% had received foot-care advice from their healthcare providers, only 45% had received education pertaining DM and diabetic foot as brochures (printed form). Studies have shown that while verbal education in itself is important, it should not be delivered alone as the sole method of patient education[23]. The use of diagrams, videos and handouts should supplement verbal communication, allowing patients to retain the largest possible amount of relevant information. That could help them manage their disease, especially in populations with low level of education (73% of the sample had not finished their secondary school education). Furthermore, 60% of the sample claimed they had not received any education regarding DM or DFD from media outlets (newspapers, radio, television, internet social media and the like). This can worsen the impact of education on knowledge scores, as studies have shown that the use of mass media outlets is an important parameter in achieving effective patient education and increasing knowledge and practice parameters for chronic diseases [24].

Conclusion

The study sample showed good DM & diabetic foot knowledge, but poor DM & diabetic foot attitudes and practices. Large percentages of subjects failed to translate their knowledge in many aspects of DM & diabetic foot prevention into actual attitudes and practices pertaining to that knowledge. Educational achievement (finishing secondary school in particular) and longer periods since diagnosis with DM were associated with a statistically significant increase in at least one of the questionnaire sections' scores, often more than one.

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The Perceived Role of Community-Based Medical Education among Kenyan-Trained Medical Doctors' Choice of Specialty

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Abstract
Background: The recruitment and retention of doctors in rural and remote areas remains a challenge that leads to inequity that favors urban populations worldwide. Sub-Saharan Africa suffers major challenges related to doctors not working in rural areas where over 60% of the population lives. Community based medical education (CBME) influence on medical doctors' choice of specialty and rural practice has been documented in a few countries but not in Kenya.
Objective: To determine the perceived role of CBME in the choice of specialty among Kenyan-trained doctors.
Study Design and Methods: An analytical cross-sectional study design was used. Medical graduates of the years 2000, 2001 and 2002 from Nairobi and Moi universities were interviewed.
Google forms were used to email the study questionnaire to the participants.
Results: The eligible number of participants for each cohort was 96, 83 and 90 for Nairobi University graduates and 49, 40 and 41 for Moi University graduates for the years 2000, 2001 and 2002 respectively. The response rates were [35.8 %(45.8, 19.3, 42.2%) and 38% (32.7, 27.5, 53.7%) for years 2000, 2001 and 2002 respectively for Nairobi and Moi University participants. Factors found to be associated with a positive perception included, the medical school, rural upbringing, parents' level of education and early rural posting. After multivariate analysis for confounders it was observed that the medical school the participant graduated from was statistically significantly associated with a positive perception on the role of CBME in the choice of specialty [Moi = 65.3(95% CI: 51.5, 79.1)] vs. Nairobi University [34.7 (95%CI: 25.1, 44.3); chi-square p-value = 0.000
Conclusions: CBME played a positive role in the study participants' choice of specialty

Key Words
Role of Community Based Medical Education; Rural Practice; Choice Specialty; Kenyan-trained doctors.

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Background

Across the globe there are multiple factors that have been associated with the preference and choice of specialization by medical students and young graduates. These factors range from parental level of education where those with more educated parents preferred specialties that result in practice in highly specialized facilities in urban areas while most female doctors have been reported to choose specialties that made it easier for them to work in non-demanding practices in urban areas[1, 2].

Some medical schools in the developed economies have chosen to implement medical curricula that favor specific specialties that are associated with these schools. This has resulted in most graduates of these schools pursuing specialty in these disciplines[3]. In medical schools in developing countries, departments that have vibrant collaborative clinical and research activities across the globe tend to attract more applicants for specialist training than those that do not have similar approach. It has also been noted that good supervision and mentoring that gives a student or young graduate opportunities to learn and enjoy a specific specialty during medical internship also plays a major role in choice of specialty. Also rated high is career guidance during training and after graduation from medical school[4].

Studies on factors that mostly influenced of choice of areas of specialty among medical students and young graduates in SSA have reported that gender, prestige associated with certain specialties and

presence of role models as main determinants of choice of specialty by medical students and the young graduates[5, 6, 7]. The perceived favorable in come in some specialties and prestige also influences career choices[8].

A survey of 56 medical doctors whose medical training involve a spiral courses on community based education and service (COBES) along problem based learning (PBL)in all the years of training in Ghana reported that the majority felt that COBES may have significantly influenced their choice of specialty and also their willingness to serve in rural Ghana[9].

The Nairobi and Moi University medical schools are the oldest in Kenya having been started in 1967 and 1989 respectively. The other approved public medical schools are in the universities of Kenyatta, Maseno, Egerton and Jomo Kenyatta University of Agriculture & Technology. Approved private medical schools are Kenya Methodist University, Uzima University and Mount Kenya University. Except for Nairobi and Moi University medical schools the rest have developed within the last decade. Aga Khan University Hospital in Nairobi offers Masters of Medicine (MMed) programs as a private university but does not have a medical school. Nairobi and Moi Universities also offer masters of medicine (MMed) and clinical fellowship programs.

The Nairobi University School of Medicine (NUSOM) and the Moi University School of Medicine (MUSOM) both offer medical training curricula that have CBME as core courses in the medical training curricula.

MUSOM offers spiral COBES courses in five of the six years of medical training. NUSOM currently offers community health rotations in level two and five of the six levels of training. NUSOM initially offered CBME only during the fourth year of medical training.

My study explored what the medical graduates perceived as the role of CBME on the individual doctor's choice of area of specialization and rural practice.

Methods

Study Site: The study was carried out in Moi University School of Medicine while data were collected from medical doctors, who are members of the selected cohorts, using their contact details provided by the Kenya Medical Practitioners and Dentists Board (MP&DB) register. Other available medical directories were also used to complement the medical board contact details.

The implementation of the Nairobi University medical school community health course for medical students was accessed on the Nairobi University School of Public Health webpage while the Moi University medical school community based education and service (COBES) course for medical students was accessed from the School Curriculum Implementation and Evaluation Committee (CIEC) secretariat.

Study Design: An analytical cross-sectional study design was used to study both the exposure and outcome of CBME among Kenyan trained medical doctors. Six cohorts (three from MUSOM and three from NUSOM) who graduated with Bachelor of Medicine and Bachelor of Surgery (MBChB) from the two medical schools in years 2000, 2001 and 2002participated in the study.

Target Population: Medical graduate cohorts of years 2000, 2001 and 2002 from Moi and Nairobi schools of Medicine who had been out of medical school for between 16 and 18years.These cohorts were conveniently selected as medical doctors who were likely to have a significant degree of career stability and also beneficiaries of more innovative medical education teaching and learning methods in these two oldest Kenyan medical schools.

Inclusion Criteria: medical graduates from Nairobi and Moi University medical schools as provided by the respective offices of school deans and as appears on alumni lists on the websites of both universities for the medical graduates of the years 2000, 2001 and 2002.

Exclusion Criteria: Medical doctors who are not graduates of NUSOM and MUSOM even if they graduated in the years 2000, 2001 and 2002.

Sample Size Determination and Sampling Procedures:

All medical graduates of NUSOM and MUSOM in the years 2000, 2001 and 2002 were eligible to participate. The contact addresses and telephone numbers of the participants were retrieved from the Kenya Medical Practitioners &Dentists Board (MP&DB) register, and the Kenyan medical directories.

The study population (see table below) was small and all members of the different cohorts were

Table 1: Illustration of the cohorts

Medical school	Medical graduate cohorts of year 2000	Medical graduate cohorts of year 2001	Medical graduate cohorts of year 2002	Total
Moi University School of Medicine	49	40	41	130
Nairobi University School of Medicine	96	83	90	269
TOTAL	145	123	131	399

Data Collection Procedures
The offices of the Deans of Nairobi and Moi medical schools were approached for authority to conduct the study and also requested to provide the lists of the cohorts that graduated in the years 2000, 2001 and 2002. The MP&DB secretariat was requested to provide available contact details (email and mobile telephone) for members of these cohorts.

Google Forms were used to get consent and to send the questionnaires **(See appendix).**

The Google Forms worked well as data collection forms which the participant clicked send after responding to the last question. The data were stored in MS Excel databases.

Data Management, Analysis and Presentation of Results
The Google Form responses were saved in MS Excel database. Reminders to participants were sent in the form of repeated email reminder messages, short text messages and telephone calls within six months. It was not possible to determine who among the non-respondents were still residing in Kenya or whether they were alive or dead. The retention register of the Kenyan medical board bears only names of doctors who pay up annual retention fees.

Data were exported to International Business Machines (IBM) Statistical Package for Social Sciences (SPSS) version 21 for analysis. Fisher's exact test was used in the analysis of the categorical data. The data was categorical in 2 by 2 contingency tables. The sample sizes were small and the expected values were small. Chi-square test was used to test for association in the categorical variables. Multivariate analysis was used for confounders. The level of significance α was arbitrarily taken as 0.05 with 95% Confidence Interval (CI). Results were presented in frequency tables.

Ethical Considerations
Ethical approval was sought and granted by the Institutional Research and Ethics Committee (IREC) of Moi University.

Permission to conduct the study was sought and granted from the Deans of Nairobi and Moi University medical schools.

Informed consent was sought from all the participants. The names of the interviewees were not revealed on the database and confidentiality was maintained.

Data are stored in password protected folders and will be destroyed as guided by the rules and regulations of IREC.

Study Limitations
Dependence on recall by participants was foreseen as a limitation. This was minimized by limiting the questions to major events and avoiding questioning details on specific CBME rotations. The tool had been pretested on medical graduates from as long as four decades before my study and compared with those of the last decade. No significant variation was noted on the responses among various cohort members during the pretest.

The response rate of less than 50% of the study was a limitation. My study did not sample but aimed to have all members of the six cohorts participate. We used the most recent available contact details as provided by the Kenya Medical Practitioners and Dentists Board. Like in all censors records in our country, there had not been updates on this record that would delete those who died, disserted the

medical career or migrated out of Kenya. It was noted that similar studies had published findings of response rates lower than 30%. The low response rates may also be attributed to medical graduates' reluctance to participate in activities outside their clinical duties.

Use of online self-administered questionnaires may have the disadvantage of the respondents' controlling their responses without the researcher involvement. During the pretest, responses of interviewer administered interviews were compared to the online responses. There was no significant difference between the two that could affect the objectives of this study

Results

The study was conducted between February and September 2018.

The response rate was calculated against the list provided by the respective medical schools. A significant proportion of these graduates were not on the current Kenyan medical board retention register and did not respond to our email and telephone communication that was sent every fortnight. After six months the effort to get responses from the non-responders was halted.

The eligible number of in each cohort was 96, 83 and 90 for Nairobi and 49, 40 and 41 for Moi University medical schools in the years 2000, 2001 and 2002 respectively. The response rates were [35.8 %(45.8, 19.3, 42.2%) and 38% (32.7, 27.5, 53.7%) for years 2000, 2001 and 2002 respectively for Nairobi and Moi University participants.

Table 2: Study population characteristics

Variable	Nairobi University	Moi University	Total
	Freq(%)	Freq(%)	Freq(%)
Age in years			
35-40	24 (24.5)	15 (30.6)	39 (26.5)
41-45	55 (56.1)	31 (63.3)	86 (58.5)
>45	19 (19.4)	3 (6.1)	22 (15)
Gender			
Male	67 (68.4)	28 (57.1)	95 (64.6)
Female	31 (31.6)	21 (42.9)	52 (35.4)
Marital status			
Single	5 (5.1)	11 (22.4)	16 (10.9)
Married	90 (91.8)	37 (75.5)	127 (86.4)
Divorced	3 (3.1)	1 (2)	4 (2.7)
Year of graduation			
2000	44 (44.9)	16 (32.7)	60 (40.8)
2001	16 (16.3)	11 (22.4)	27 (18.4)
2002	38 (38.8)	22 (44.9)	60 (40.8)
Employer			
Self	11 (11.2)	7 (14.3)	18 (12.2)
Private institutions	12 (12.2)	8 (16.3)	20 (13.6)
University	27 (27.6)	12 (24.5)	39 (26.5)
Ministry of Health	48 (49)	21 (42.9)	69 (46.9)
Research Institute	0 (0)	1 (2)	1 (0.7)
Post medical training			
None	9 (9.2)	15 (30.6)	24 (16.3)
Masters in Medicine	73 (74.5)	27 (55.1)	100 (68)
Masters in Public Health	11 (11.2)	2 (4.1)	13 (8.8)
Masters in Palliative Care	3 (3.1)	1 (2)	4 (2.7)
PhD	0 (0)	1 (2)	1 (0.7)
Masters in Medicine plus (Clinical Fellowship or PhD)	2 (2)	3 (6.1)	5 (3.4)
Where you grew up			
Rural	78 (79.6)	29 (59.2)	107 (72.8)
Urban	18 (18.4)	19 (38.8)	37 (25.2)
Both	2 (2)	1 (2)	3 (2)
Father's education level			
None	13 (13.3)	5 (10.2)	18 (12.2)
Primary	18 (18.4)	14 (28.6)	32 (21.8)
Secondary	35 (35.7)	14 (28.6)	49 (33.3)
College	32 (32.7)	16 (32.7)	48 (32.7)

The study population was youthful with 58.5 % of the population aged 41-45 years. Sixty-eight percent of the respondents were masters of medicine graduates majority of who worked in public service. Seventy- three percent reported growing up in rural Kenya.

Table 3: CBME role on choice of specialty

Variable	Poor Freq(%)	Good Freq(%)
Medical school		
NUSOM	64 (65.3)	34 (34.7)
MUSOM	17 (34.7)	32 (65.3)
Age in years		
35-40	24 (61.5)	15 (38.5)
41-45	45 (52.3)	41 (47.7)
>45	12 (54.5)	10 (45.5)
Sex		
Male	48 (50.5)	47 (49.5)
Female	33 (63.5)	19 (36.5)
Marital status		
Single/ Divorced	13 (65)	7 (35)
Married	68 (53.5)	59 (46.5)
Year of graduation		
2000	29 (48.3)	31 (51.7)
2001	13 (48.1)	14 (51.9)
2002	39 (65)	21 (35)
Where you grew up		
Rural	54 (50.5)	53 (49.5)
Urban	24 (64.9)	13 (35.1)
Both	3 (100)	0 (0)
Mothers education		
None	5 (26.3)	14 (73.7)
Primary	31 (58.5)	22 (41.5)
Secondary	20 (51.3)	19 (48.7)
College	25 (69.4)	11 (30.6)
Fathers education		
None	6 (33.3)	12 (66.7)
Primary	16 (50)	16 (50)
Secondary	21 (42.9)	28 (57.1)
College	38 (79.2)	10 (20.8)
Rate of rural experience		
Poor	11 (73.3)	4 (26.7)
Good	47 (47)	53 (53)
No rural	23 (71.9)	9 (28.1)
Rate CBME yr4		
Poor	18 (75)	6 (25)
Good	63 (51.2)	60 (48.8)

Summary of Findings on the Perceived Role of Community-Based Medical Education (CBME) in the Choice of Specialty by Medical Graduates

The factors associated with positive perception on the role of CBME in choice of specialty were: the medical school; where the doctor's spouse grew up; the doctor's mother level of education; the doctor's father level of education and good rating of previous rural experience in early practice.

On controlling for confounders for the five factors it was observed that the medical school in which a doctor trained was found to have statistically significant association with the positive perception of the role of CBME in the choice of choice specialty. Moi University medical graduates [65.3 (95% CI: 51.5, 79.1)] vs. Moi University medical graduates [34.7 (95%CI: 25.1, 44.3); chi-square, p-value = 0.000].

Discussion

Perception of Community-Based Medical Education (CBME) by Medical Students and Young Graduates

The positive perception on the role of CME in career growth by my study participants was higher among medical graduates of Moi University than those of Nairobi University

Students' perception and perspective of CBME has been studied in different CBME delivery contexts. There is evidence of reported perception of better preparedness for clinical roles in British young medical graduates who had CBME as part of their medical curriculum. The positive impact was in comparison with those that did not CBME in their medical curriculum. The perceived positive impact was by both the medical graduates and those who supervised their internship activities[10].

Australian medical graduates who had CBME as part of their medical training were found to demonstrate more social accountability and better skills to serve disadvantaged and rural communities than those who did not have CBME as part of their medical training[11].

Community-Based Medical Education Versus Community Oriented Medical Education

It was observed that Moi University medical school offered Community Based Education and Service (COBES) program in the form of spiral courses from year one to five that had up to six week rotations within communities. These are communities that the medical graduates are expected to serve. Nairobi University medical school offered more of a Community Oriented Education (COE) program with a one term in the fourth year of the medical training program. The courses are provided by the Nairobi University School of Public Health and are mainly didactic with several one-day visits to rural communities.

In Malaysia, Sahid documented a significant difference in the commitment to rural and community health care for medical students who had in medical school who offered similar programs during medical training[12].

In historical cohort comparison of three traditional medical schools in Quebec, Canada, transition from a tradition medical curriculum to one with a community oriented problem based learning component was associated with significant improvements in preventive care, continuity of care and improvement in indicators of diagnostic performance of the graduates compared to the ones before the transition. Graduates of medical curricula with CBME demonstrated improved skills and practice on disease prevention and emphasis on continuity of care[13].

The Medical Education Partnership Initiative (MEPI) for selected African medical schools and funded by the government of the United States of America to promote medical education with emphasis on enhancing CBME has impacted positively on improved skills and interest among medical graduates to serve in rural and underserved populations[14].

Factors Associated With Choice of Specialty by Medical Students

I studied the perceived role of CBME in the choice of specialty by doctors. Data on factors that influence specialty choice revealed similarity across the globe. The factors reported to influence the choice of specialty by my study population included mentoring during and after medical school, whether a doctor brought up in rural or urban settings, the parents level of education and culture in the medical school a doctor was trained in, among factors.

Harris, Gravel & Young studied the factors influencing the choice of specialty among Australian medical graduates. The highest rated factors included appraisal of own skills and aptitudes, intellectual content of the specialty and extrinsic factors such as work culture and flexibility of working arrangements. All of these were personal and not based on social accountability. CBME as a factor was not even rated in the Harris' study[15].

A study on senior medical students and young medical graduates in New Zealand reported that career choice was mostly based on interest in the specialty and that individuals favored specialties that

were likely to enhance chances for a doctor to work outside New Zealand. Also favored were specialties that were likely to lead to super specialty training[16].

In a medical college in southern India, Subba, et al, conducted a survey on medical students. The questionnaires enquired about the students' preferred specialty and the factors that influenced the choice. The findings were that these students rated the following in order of preference: high interest in high paying specialties, job satisfaction (including potential for high prestige) and employment opportunities for the individual doctor. Low interest in primary care specialty that offered low paying working opportunities in rural India was also observed[17].

Medical students at the Jordan University of Science and Technology reported their choice of specialty to be influenced by perceived intellectual content of the specialty and the reputation of the specialty[18].

Significant variation in career choices by medical students was documented in United Kingdom (UK) graduates of 1999 and 2000. It was evident in the study findings that some of these UK medical schools had a "culture" that encouraged interest in certain specialties while diminishing interests in others[19].

In countries where the time period between leaving medical school and starting of specialty training is not as big as it is in Kenya (where it sometimes takes more than five years or never happens), medical students are expected to choose and compete for their choice of specialties by the time they finish medical training. Though this has the advantage of continuity in medical training and shortening the period it takes for a doctor to become a specialist, Luther documented a significant sense of unpreparedness for UK medical students who were expected to decide on area of specialization by end of medical school[20].

Final year medical students in public universities in Nigeria chose specialty preference because of expected better income and anticipated opportunities for career progression[21, 22].

In Kenya, Mwachaka and Mbugua attributed role modeling which created enthusiasm in a specialty as one of the major factors determining choice of specialty among medical students and new graduates [23].

The Role of CBME in the Choice of Specialty by Doctors

My study results showed a statistically significant difference in reported positive influence of CBME in choice of specialty between the medical graduates of Nairobi and Moi Universities. It is noted that medical graduate cohorts of the years 2000, 2001 and 2002 had gone through a medical training curriculum that had different approaches to CBME in Nairobi and Moi Universities. While the Moi University curriculum had community based education and service courses and rotations in years one to five, the Nairobi University one had a community health course in the fourth year of training.

The South Australian Flinders University Parallel Rural Community Curriculum (PRCC) is a government initiative started in 1997 to help address the rural doctor workforce shortage in Australia. The initiative involves a one year clinical rotation in rural Australia as part of medical training in students who enroll for this program. A study on the impact of this initiative on choice of specialty by the graduates of the PRCC showed that it significantly influenced the graduates to choose a rural career path[24].

Similar studies in Australia have supported the importance of CBME as a strong component of the medical training curriculum to enhance choice of specialties that relate to health needs of the people[15, 25, 26].The same may explain the significant difference observed between Moi and Nairobi University medical graduates' positive perception on the role of CBME on choice of specialty.

Amalba, Mook, Mogre and Scherpbier interviewed pioneering graduates of Problem Based Learning/ Community Based Education and Service (PBL/ COBES) curriculum in a medical school in Ghana documented over half of the doctors reporting that COBES had positively influenced their choice of specialty. The participants in the Amalba study were doctors serving in both rural and urban parts of Ghana. The doctors reported that even students brought up in urban areas reported COBES rotations changed their perceptions of rural practice positively and a significant number had chosen career lines and specialties that favored rural practice[27].

Conclusions

1. The findings of this study concur with similar studies done in other contexts in the findings that community based medical education has a positive role in the medical graduate's choice of specialty
2. The difference in perceptions on the positive role of community based medical occupation from Kenyan medical graduates whose only difference was the medical school they trained

in and the way the course delivered was noted
3. Exposure of rural Kenya to persons in early life, during training and early career posting played an important role in the choice of specialty

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I declare no conflict of interest

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Surgical Snapshot: Management of Right Iliac Fossa Pain in Adults and Children

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Abstract
Right iliac fossa pain is one of the most common acute presentations to the general surgical department. The management of right iliac fossa pain amongst different ages and different genders can present a clinical conundrum to newly qualified doctors. We detail the common causes of right iliac fossa pain, the signs, symptoms and management options in different groups.

What this paper adds:
This paper seeks to summarise the differential diagnoses of acute right iliac fossa pain. This would aid diagnosis and potential management options for junior doctors encountering this presentation in their early career.

Key Words
Right Iliac Fossa Pain; Acute Appendicitis; Adults; Children.

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Introduction

Acute onset right iliac fossa pain, in all age groups, is a common presentation often referred to the general surgical team. Acute appendicitis is the most common indication for surgery and discerning this from other causes has long been a clinical challenge.

The diagnosis of acute appendicitis remains one guided by clinical acumen and enhanced by various diagnostic techniques; novel biochemical markers and scoring systems have been attempted to be implemented with varying levels of success.

This clinical review aims to cover the salient points of the common differential diagnoses of right iliac fossa pain (Table 1). It will also look to give clinicians a useful insight into the management of each of these conditions.

What are the common causes of acute right iliac fossa pain?

Table 1: Common causes of acute right iliac fossa pain

Adults	Female	Paediatrics	Elderly
Ureteric colic	Mittelschmerz	Gastroenteritis	Diverticulitis
Perforated peptic ulcer	Pelvic Inflammatory Disease (PID)	Mesenteric adenitis	Intestinal obstruction
Testicular torsion	Ectopic pregnancy	Meckel's diverticulitis	Colon cancer
Pancreatitis	Torsion/ rupture of ovarian cyst	Intussusception	Mesenteric ischaemia
Rectus sheath haemato-ma	Endometriosis	Henoch-Schoenlein Pur-pura	Leaking abdominal aortic aneurysm
Crohn's ileitis	Retrograde menstrua-tion	Lobar pneumonia	
Pyelonephritis			

Appendicitis
Acute appendicitis is the most common cause of acute abdomen in the UK with a prevalence of 10%. It is an important presentation of right iliac fossa pain. The pathology is that of inflammation of the vermiform appendix, which is located below the terminal ileum. The base has a fixed position and is found from the confluence of the taenia coli which join to form the outer longitudinal muscle of the appendix (Williams et al 2008).

The pathophysiology of acute appendicitis is still not completely understood. The most common process is obstruction of the appendiceal lumen and subsequent infection of the wall due to translocation of gut bacteria. Causes of this obstruction include faecoliths, Crohn's disease, parasites, neoplasia and many more.

Right Iliac Fossa Pain in Specific Patient Groups:
Females
Female patients are diagnostically challenging for appendicitis. Conditions such as pelvic inflammatory disease (PID), mittelschmerz (unilateral lower abdominal pain associated with ovulation), torsion/ rupture of an ovarian cyst or haemorrhage and ectopic pregnancy are important differential diagnoses. A thorough history is essential including: menstrual cycle, dysmenorrhoea, vaginal discharge, hormonal contraception and pregnancies.

Ectopic pregnancy is a particularly important differential of right iliac fossa pain. Without accurate diagnosis and management this can become life-threatening. Ectopic pregnancy occurs when a fertilised egg implants outside the endometrial cavity, resulting in eventual death of the embryo. The classic triad of symptoms is: abdominal pain, amenorrhea and vaginal bleeding. Unfortunately, many patients do not present this way and thus a high index of suspicion in females of child bearing age is required.

PID is an infectious and inflammatory disorder of the upper female genital tract (including the uterus, fallopian tubes and adjacent pelvic structures). It is caused by ascending infection from the vagina and cervix, and may spread to the abdomen. The classic presentation is a woman of child bearing age with multiple sexual partners and no/inconsistent contraception.

Pregnancy
Appendicitis is the most common extra-uterine cause of acute abdominal pain in pregnancy. Current obstetric teaching states that the caecum is pushed to the right upper quadrant by the gravid uterus and therefore the classical signs and symptoms of appendicitis may be different in this population.

Children
Children present a challenging group to investigate as they are not always able to inform the clinician of their exact symptoms. The most common diseases in this age group that may mimic appendicitis are mesenteric adenitis or gastroenteritis. Appendicitis is a rare presentation below the age of three, as the base of the appendix is wider and funnel shaped and less likely to be obstructed. Above this age, children have an underdeveloped omentum, less able to limit the spread of purulent material from a perforated appendix. Therefore, they are unlikely to present with classical migratory pain and often present with frank peritonitis.

Mesenteric adenitis may present with cervical lymph nodes. The pain is colicky in nature and normally resolves within a few days. The symptoms of abdominal pain in this age group are normally preceded by a recent upper respiratory tract infection which raises the clinical suspicion of this diagnoses and is generally associated with normal inflammatory markers.

Meckel's diverticulitis may present with left sided or central abdominal pain, and is often difficult to distinguish clinically from acute appendicitis. In this age group, there may be symptoms of lower gastrointestinal bleeding: Meckel's diverticulum is a remnant of the vitelline duct, containing pluripotent cells which may contain heterotopic tissue. Most commonly, this is gastric mucosa which can lead to acid secretion, ulceration and bleeding of adjacent mucosa.

Elderly
Appendicitis has a bimodal distribution. In the elderly age group other important diagnoses to consider are: neoplasia, diverticulitis or bowel obstruction. In this age group (>50 years) computed tomography is a valuable tool to elucidate the cause of abdominal pain and avoid an exploratory laparotomy (Figure 1). The Royal College of Surgeons (RCS) and ASGBI (Association of Surgeons of Great Britain and Ireland) devised guidelines for the management of acute abdominal pain in those over the age of 50 to prevent harm through unnecessary surgical intervention.

Sigmoid diverticulosis/diverticulitis may mimic appendicitis especially in patients with a long sigmoid loop. Additionally, perforated or obstructed carcinoma of the caecum may present with identical

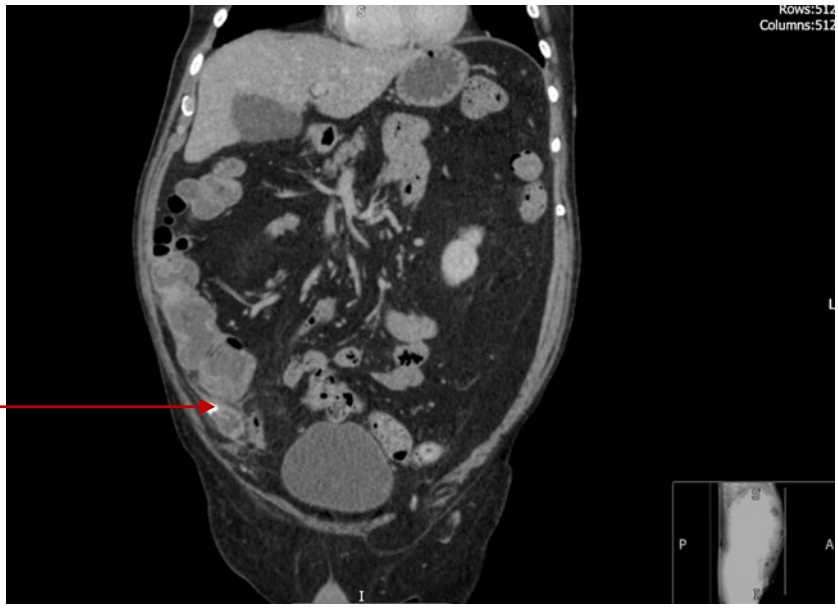

***Figure 1**: CT showing acute uncomplicated appendicitis in 70-year-old patient*

What are the symptoms of acute appendicitis?
The clinical presentation of acute appendicitis is highly variable; this is due to positional variation of the appendix, degree of inflammation and age of the patient. The classical presentation of: anorexia, vomiting and migratory right iliac fossa pain, is found in approximately half of patients.

The classical presentation of central abdominal pain that migrates to the right iliac fossa reflects an inability to localise the pain until there is visceral irritation. The appendix is part of the midgut and therefore produces this poorly localised pain (classically central abdomen); when there is local inflammation and irritation of the parietal peritoneum, pain is more constant and localised pain.

What are the signs of acute appendicitis?
The signs associated with acute appendicitis are low grade fever, localised abdominal tenderness and guarding (Table 2). Classically the patient is tender over McBurney's point with rebound tenderness.

Table 2: Important signs of appendicitis

Important Signs
Low grade fever
Localised abdominal tenderness
Guarding

There may also be the presence of Rosving's sign (palpation in the left iliac fossa produces pain in the right iliac fossa, as pressing on the left colon may distend the caecum). More rarely psoas sign may be present, which will cause the patient to lie with the hip flexed to alleviate the pain (the appendix lies on the psoas muscle and suggest a retrocaecal position). Finally, Obturator sign suggests pain due to an inflamed appendix pressing on obturator internus which is felt on passive internal rotation of a flexed right hip (Table 3).

Table 3: Eponymous signs related to appendicitis

Eponymous Sign	Clinical Picture
Rosving sign	Pain felt in the right iliac fossa on palpation of the left (attempt to distend the caecum by pushing the left colon)
Psoas sign	Pain felt on stretching iliopsoas by extending right hip (suggests retrocaecal appendix)
Obturator sign	Pain felt on internally rotating flexed right hip

Variation in Appendiceal Anatomy
Specific positions of the appendix may also give differing signs (Figure 2).

Retrocaecal:
Due to overlying bowel gas it is difficult to exert pressure on the appendix and therefore patients will be less rigid and less tender on light palpation.

Pelvic:
Where the appendix is contact with the rectum or bladder respectively, it may present with diarrhoea or urinary symptoms.

Postilieal:
This presents with more vague signs as the pain may not radiate and is ill defined due to the position.

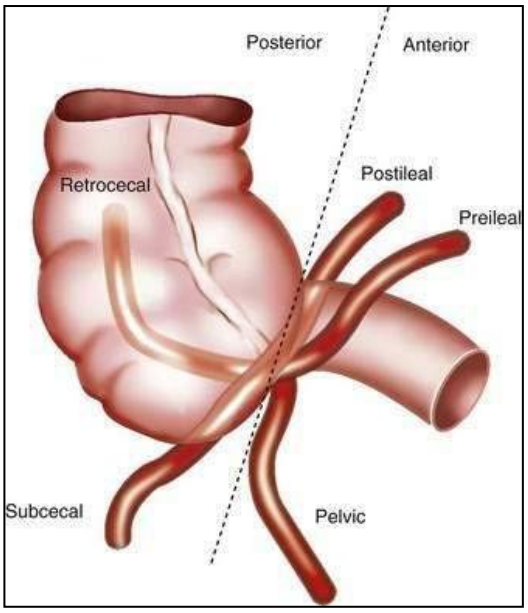

Figure 2*: Positions of the vermiform appendix (Buschard and Kjaeldgaard, 1973).*

How is appendicitis investigated?
Investigation of acute appendicitis is again age and gender specific. In the younger age group, a period of watchful waiting may occur to avoid unnecessary surgical procedures, especially if there is any doubt.
In female patients due to the variety of differential diagnoses ultrasonography (including transvaginal and transabdominal scans) is often utilised to elucidate the cause. Importantly blood and urine b hCG is a mandatory investigation on admission to rule out ectopic pregnancy.

In the elderly, the mainstay of investigation involves computed tomography to identify an alternative pathology, due to the increased chance of a neoplastic process.

In adults if there is any doubt then decision to operate may sometimes be delayed, if the patient is not in extremis. Often however, the risk of non-operative intervention versus negative appendicectomy is greater and therefore a decision to operate should be taken early to avoid an increased morbidity/ mortality to the patient.

Various scoring systems have been employed in the past and in some centres are still used. They are largely an aid to diagnosis; the diagnosis of acute appendicitis remains a clinical one aided by various biochemical and imaging modalities.

How is appendicitis treated?
The mainstay of management of appendicitis is appendicectomy. Various studies have examined the use of antibiotics over operative management; these have been largely inconclusive with the only inference, that antibiotic management only may be best suited to those unfit for an operation (Wilms et al 2011). In cases of non-operative management there is a risk of recurrent appendicitis and there may be a role for interval appendicectomy, especially in patients who have developed an appendicular abscess/ mass.

The operation itself can be either laparoscopic or open. Open appendicectomy is sometimes reserved for those with CT diagnosed appendicitis and no alternative pathology, those who would not tolerate a raised intrabdominal pressure due to other morbidities and in the paediatric setting in a non-paediatric surgical centre. The current evidence suggests that laparoscopic appendicectomy is beneficial over open, in terms of reduced out of hospital complications, despite initial greater cost of this operative treatment (Sauerland et al 2010).

Regardless of the method of appendicectomy, patients benefit from a period of pre-operative fluid resuscitation and intravenous antibiotics (according to hospital protocol) to limit the incidence of wound infections.

Summary

Acute appendicitis is a common presentation to UK hospitals and one with the greatest need for operative intervention. A thorough history, examination and supplementary investigations may aid in appropriate management. The differential diagnoses are important to be aware of to reduce the number of negative appendicectomies.

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Patient's Autonomy: The Right to Choose Who Patients Consult in a Public Teaching Hospital

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Abstract
Medical teaching is based on the apprentice model; students learn from their teachers by acquiring the necessary knowledge, attitude and skills that prepare them to become doctors. In this process, students assess patients and present their findings to their teachers. Patients exercising their autonomy can object to being assessed by students. Their refusal can, on the other hand, create challenges for medical teachers and students. Practising medicine whilst experiencing emotional reactions can pose challenges in adhering to the principles of beneficence and non-maleficence. These issues are explored in the context of a real incident in which a patient refused to be examined by a medical student. From these experiences, I aim to provide some clinical context, explore assumptions of parties involved and discuss future ways to handle these complex issues. These are likely to relate to medical students globally, who may experience similar situations. Pinning this argument against the pillars of medical ethics allows objective and rational exploration of such underlying ethical challenges.

Key Words
Medical Students; Medical Education; Autonomy; Beneficence and Non-maleficence.

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Introduction

I am a fifth-year medical student. Recently I was allowed to see patients on my own, on my general surgical run. I was taught to first explain my role as a medical student to the patients and ask whether they would be happy to see me before the consultant came in. I would take a history, perform an examination and provide some brief advice. Then, I would explain my findings and management plan to my consultant. He would see the patient, modifying my plan when appropriate. One particular day, I was asked to see an elderly patient presenting with problematic PR bleeding. The patient, however, said he preferred not to *"see a student, as I am here for an actual problem and want to see someone who can actually help me."*

I explained the situation to the consultant. He appeared indignant at the patient's response, telling me *"this is a teaching hospital, you are a student and you will only become a doctor if you are able to practice what doctors do."* If the patient wanted *"to dictate his own healthcare, then he should visit a private hospital."* The consultant said, "*let the patient wait in the room for 30-40 minutes, let's go see the others before him."* This *"served him right" for "disrespecting the traditions of medical education."*

Discussion

My consultant's response pleased me initially. I felt happy to know I had the top man on my side. On further reflection, however, this interaction provided ethical challenges. The patients' rights to appropriate healthcare and their autonomy in decision-making challenged traditions of medical education based on the apprenticeship model of learning. I reflected on the four pillars of medical ethics (autonomy, non-maleficence, beneficence, and justice) and tried to examine how they applied to this encounter. There was a direct conflict between what the patient desired and the mindset of the consultant. I felt the consultant doctor, acting on his beliefs, chose to delay his consultation with the patient- almost punishing the patient for his behaviour. In my view, the patient received delayed, arguably poorer, healthcare than what he would have expected.

I wanted to first examine the patient's point of view. His presentation with PR bleeding was potentially sensitive and worrying. Health concerns may provoke feelings of uncertainty and discomfort amongst the general population. Doctors, being experts in this field, are entrusted with the sacred responsibility of managing individuals' health and

alleviating such fears. They use a range of communicative behaviours that during consultation including instrumental (cure oriented) vs affective (care oriented) behaviour, verbal vs non-verbal behaviour, privacy behaviour, high vs low controlling behaviour, and medical vs everyday language vocabularies. Not paying attention to the most appropriate communication behaviour specific to a situation may have far reaching consequences including poor patient satisfaction, inadequate treatment adherence and difficulties with recall and understanding of information. In the context of my patient, who clearly wished to see a senior doctor to address his concerns acknowledging his concern could have enabled him to experience care orientated intervention and not just cure. In his eyes, only a doctor, not a mere medical student, was capable of providing this service. Putting myself in his shoes, I could see his choice was understandable.

Furthermore, the Code of Health and Disability Service Consumers' Rights (HDC) offers protection of rights to the users of health or disability service in New Zealand (Code of Health and Disability Service Consumers' Rights, 2020). Section 4(1) of the code states, "Every consumer has the right to have services provided with reasonable care and skill" and 4(3) "Every consumer has the right to have services provided in a manner consistent with his or her needs." I realised the patient had the right to be autonomous in his decision making about who he wanted to see. By exercising his autonomy, the patient had decided that only a doctor, and not a student, was able to provide reasonable care. It is difficult to argue against this logic, given how explicitly it aligns with the Rights that patients are clearly entitled to.

Despite *understanding* these actions and even agreeing with them, I still felt slightly bitter towards the patient. It felt as if he had undermined my ability. I felt devalued. I found myself agreeing with my consultant's position that the patient was willing to 'take' from the public healthcare system, without 'giving back' by disallowing me the chance to learn and practice my practical skills. These thoughts were then followed by doubts like, "Am I allowed to even think like that?" "Are there written guidelines, as there was for the patient and the HDC, that medical students *are meant* to see patients?"

Some of these questions were answered by reflecting on the advice I had received from my consultant. My consultant clearly appreciated the significance of clinical exposure and that of developing a personal skillset for medical students. I learned there is a strong tradition of learning and teaching in Medicine, tracing back to Hippocratic times. This system ensures medical students acquire the knowledge, attitude and skills required to practice medicine safely and independently. If they were unable to learn by practicing, they will not be able to treat patients one day. He was also sensitive to the functioning of a healthcare system- realising our limited experience level. Instead of letting us run rampant with decision-making, he made an effort to oversee management plans and ensure the patient received appropriate care, ultimately from a consultant's level of experience. As a result, I felt, his model of teaching satisfied both student-learning *and* patientcare.

I am acutely aware my consultant was not unique in his stance. This culture of bedside teaching and learning is widespread across the globe and indeed is reported to be preferred by most patients (Ghimire, et al., 2019). Simply put, this is how we learn! The patient, when refusing to see a student and wishing only for a senior doctor, challenged both the consultant's beliefs *and* the structure of the hospital system. The doctor, perhaps, perceived the patient to be ungrateful and insensitive to traditions in clinical environments. This aggravation could possibly explain the consultant's decision to delay the consultation in an attempt 'to teach the patient a lesson.' I can understand the indignant reaction, again on a psychological level. I myself felt annoyed and liked the fact that the doctor was somehow 'stepping up for me.'

Since then I have also learned the significance of not acting while feeling angry. Arguably, the consultant did the right thing by not attending to the patient while he was upset. We have a responsibility to care for our patients. Being free from emotional influences ensures that we make objective decisions and act on principles of beneficence and non-maleficence. I would argue that by delaying the consultation, my consultant made a rational decision which avoided compromise of these core pillars of medical ethics.

The misuse of responsibility and power always exists in any doctor-patient interaction. In this instance the patient placed his trust and confidence in the consultant, who in my initial opinion, used this power to 'punish' the same very patient. This misuse of power amongst vulnerable individuals contradicted core beliefs that I have surrounding our role as doctors. If a doctor is to treat a patient while harbouring negative feelings against them, they are at higher risk of breaching the duty of "*Primum non nocere*" or *"first, do no harm"* (Lloyd, 1983). Active acknowledgement of the dually occurring tensions between the experience of negative emotions and the requirement for rationality is

perhaps crucial in ensuring we deliver objective, appropriate care. These values were the same very ones that attracted us to a career in medicine in the first place (Robinson, 1985).

Conclusion

These events prompted me to think about how I would handle this particular situation and other similar ones, should I encounter them in the future. When I become a consultant, I will need to take time to understand my patient's background and their reasons behind their decisions or actions. Understanding the patient's autonomy to decision-making is crucial. I must also realise that I am not impervious to emotional fluctuations. I will need to learn to act in a manner which sits true to what I believe in. This was a strength that I saw from the consultant; he was able to stick to his core beliefs about the apprentice model of medical teaching and the spirit of the public health system.

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Clinical Practice
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Management of Ectopic Pregnancy

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Abstract
Ectopic pregnancy can be defined as any pregnancy implanted outside the uterine cavity. It occurs in 11/1000 pregnancies in the UK and is an important cause of maternal mortality in the first trimester (1). Many patients who develop ectopic pregnancy do not have any specific risk factors (1). Patients with ectopic pregnancy often become haemodynamically unstable and initial management is essential to improve outcomes.

Key Words
Ectopic Pregnancy; Gynaecology, Pre-operative; Clinical; Haemorrhage; Haemorrhagic Shock; Shock; Surgery; Transfusion.

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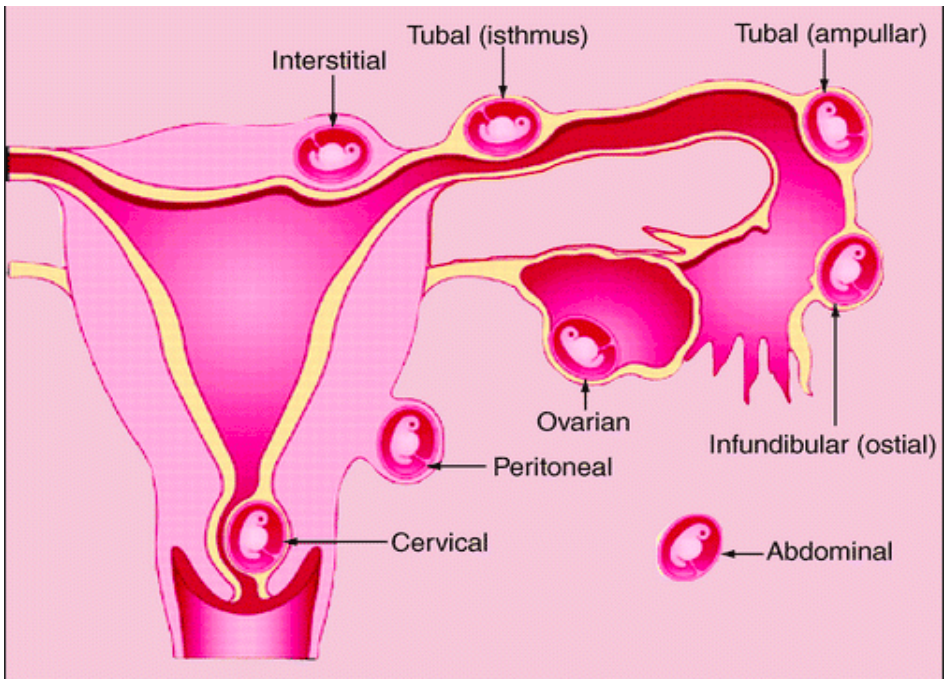

***Figure 1**: Locations of ectopic pregnancy*

Classification of Ectopic Pregnancy

Tubal ectopic: interstitial, corneal, ampullary and fimbrial ectopics
Cervical ectopic
Heterotopic ectopic
Ovarian ectopic
Abdominal ectopic
Pregnancy of unknown location
Caesarean scar ectopic

Risk Factors

There are several known risk factors for ectopic pregnancy however as mentioned above most patients do not possess any risk factors (1). Therefore if none of the below are present, clinical suspicion and treatment should not be altered based on this.

Risk Factors for Development of Ectopic Pregnancy
Previous ectopic pregnancy
Pelvic inflammatory disease and genital infections
Infertility and IVF treatment
Tubal surgery e.g. sterilisation
Smoking
Previous or current intrauterine device

Clinical Presentation

Common presentations of ectopic pregnancy include pelvic or abdominal pain and vaginal bleeding. Other symptoms may include diarrhoea, vomiting, dizziness, syncope, shoulder tip pain, dysuria or breast tenderness[4]. Patients may also be completely asymptomatic.

Positive findings on examination include abdominal tenderness, abdominal distension, guarding, postural hypotension and adnexal tenderness[4].

If the presentation is of a live or ruptured ectopic pregnancy, patients will rapidly deteriorate due to bleeding into the intra-abdominal cavity and may present with haemorrhagic shock[4]. In this case they are likely to be tachycardic, tachypnoeic, hypotensive with an altered mental state.

Ectopic pregnancies are often missed due to the non-specific nature of the presentation.

***Table 1**: ATLS guideline for stages of haemorrhagic shock*

	Class of Hemorrhagic Shock			
	I	**II**	**III**	**IV**
Blood loss (mL)	Up to 750	750-1500	1500-2000	> 2000
Blood loss (% blood volume)	Up to 15	15-30	30-40	> 40
Pulse rate (per minute)	<100	100-120	120-140	> 140
Blood pressure	Normal	Normal	Decreased	Decreased
Pulse pressure (mm Hg)	Normal or increased	Decreased	Decreased	Decreased
Respiratory rate (per minute)	14-20	20-30	30-40	>35
Urine output (mL/hour)	>30	20-30	5-15	Negligible
Central nervous system/mental status	Slightly anxious	Mildly anxious	Anxious, confused	Confused, lethargic

Diagnosis
Transvaginal ultrasound is the diagnostic tool of choice for tubal ectopic pregnancy[6]. Tubal ectopic pregnancies should be positively identified, if possible, by visualising an adnexal mass that moves separate to the ovary.

A serum progesterone level is not useful in predicting ectopic pregnancy[6].

A serum beta-human chorionic gonadotrophin (b-hCG) level is useful for planning the management of an ultrasound visualised ectopic pregnancy. In some cases, a repeat serum b-hCG in 48 hours may be useful in deciding further management[6].

Management Options
A laparoscopic surgical approach is preferable to an open approach if patient haemodynamically stable[6]. Laparotomy may be the preferred route if patient in shock.

In the presence of a healthy contralateral tube, salpingectomy should be performed in preference to salpingotomy[6].

In women with a history of fertility-reducing factors (previous ectopic pregnancy, contralateral tubal damage, previous abdominal surgery, previous pelvic inflammatory disease), salpingotomy should be considered.

If a salpingotomy is performed, women should be informed about the risk of persistent trophoblast with the need for serum b-hCG level follow-up.

They should also be counselled that there is a small risk that they may need further treatment in the form of systemic methotrexate or salpingectomy[6].

Systemic methotrexate may be offered to suitable women with a tubal ectopic pregnancy. It should never be given at the first visit, unless the diagnosis of ectopic pregnancy is absolutely clear and a viable intrauterine pregnancy has been excluded.

Expectant management is an option for clinically stable women with an ultrasound diagnosis of ectopic pregnancy and a decreasing b-hCG level initially less than 1500 iu/l.

Offer anti-D prophylaxis as per national protocol to all RhD-negative women who have surgical removal of an ectopic pregnancy, or where bleeding is repeated, heavy or associated with abdominal pain[6].

Immediate Management of the Unstable Patient
In the haemodynamically unstable patient with suspected ectopic pregnancy[7]:

1. Move to resuscitation area
2. Call for help
3. ABCDE
4. High flow oxygen
5. 2x large wide bore cannulas
6. Cross match 6 units of blood
7. IV fluids while waiting for blood to become available
8. Start transfusion of RBCs
9. Inform gynaecology team, anaesthetist and theatres
10. Prioritise transfer to theatre

Investigations
Investigations in the unstable patient should not delay initial management. The following investigations should be completed if available prior to theatre:

- Urine HCG
- Serum HCG
- Focused assessment with sonography for trauma (FAST) scan of the abdomen to look for free fluid
- Blood grouping and rhesus status – Anti-D must be given within 72 hours if rhesus negative
- Full blood count, clotting screen, group and screen

Transfusion Management in Major Haemorrhage
Major haemorrhage can be defined as bleeding that causes a systolic blood pressure of less than 90mmHg and a heart rate of greater than 110 beats per minute[8].

Transfusion with red blood cells is usually required after 30% of the total blood volume is lost and if the patient is in Class III/IV shock[5]. Administration of packed red blood cells will maintain the oxygen carrying capacity and blood flow to vital organs[5]. Often haemoglobin testing is misleading in an acute bleed as the level is often normal or unchanged[5]. If immediate transfusion is, O negative blood should be used rather than waiting for cross-matched or group-specific blood (Rh negative red blood cells should be given to women of child-bearing age). However as soon as cross-matched blood is available this should be used instead of O negative[5].

The use of fresh frozen plasma and platelets will adjunct haemostasis and the ratio in which to transfuse this will be outlined in the hospital's local major haemorrhage protocol.

Multiple-Choice Questions

1. Which of the following are risk factors for ectopic pregnancy: *(more than one option may be selected)*

A Family history of ectopic pregnancy
B The patient has a mirena coil in situ
C History of multiple miscarriages
D Smoking

2. Which of the following statements are true regarding Class II haemorrhagic shock: *(more than one option may be selected)*

A hypotension will be present
B tachycardia will be present
C the respiratory rate will be normal
D blood transfusion is always required

3. Concerning the presentation of a patient with an ectopic pregnancy the following features may exist:*(more than one option may be selected)*

A generalized abdominal pain
B vomiting
C dizziness
D all of the above

4. A 22 year old female presents to A&E with non-specific abdominal pain and one episode of vomiting. She has had one episode of feeling faint but no collapse. Her LMP was 6 weeks ago and a urinary pregnancy test is positive. During assessment in A&E you notice that her next set of observations show a blood pressure of 80/40.

Regarding the above case study, what is your next plan of action?
A ABCDE and move to resuscitation area
B A quick ABCDE assessment then transfer to CT scan
C Attempt to get IV access
D Take a full blood count and group and screen sample

Her next set of observations show a BP of 70/35, HR of 110 and RR of 30. She now as IV access and her group and screen sample has just been sent.

5. You decide you want to start a transfusion of red blood cells. How would you proceed?
A transfuse 6 units of cross matched blood
B transfuse 6 units of group specific blood
C transfuse 6 units of O negative blood
D commence transfusion with O negative blood then use cross-matched blood when it becomes available

Answers

1. B and D
2. B
3. D
4. A

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Review Article
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The Role of Innate Factors in The Aetiology of Obesity

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Abstract
Obesity is a complex, multi-aetiological and multifarious condition caused by the interaction of a number of factors including reduced physical activity, innate genetic make-up, ethnicity and a disadvantaged socioeconomic status. The aims of this review were to ascertain, through effective literature search, the innate factors that predispose an individual to developing obesity and to suggest recommendations for the prevention of obesity. These factors can be divided into biological and non-biological causes that includes genetics, hormones, education and income, lack of exercise, ethnicity and migration. It was found that certain genes may cause pathological alterations due to the alteration of proteins that regulate the appetite and satiety centres, while mutations in the polygenic genes inhibit the leptin-melanocortin pathway that regulates the energy homeostasis. Furthermore, changes to gut microbes could be associated with a higher risk of developing obesity due to a change in the absorption of nutrients. Education, behavioural changes and environmental approaches may be effective in promoting healthy lifestyle habits and in mitigating an obesogenic environment.

Key Words
Obesity; Leptin-melanocortin Pathway; Single Nucleotide Polymorphisms; Beta-arrestin Pathway; Epigenetics

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Introduction

Obesity, which is now considered as a non-communicable disease by the WHO, has become one of the greatest healthcare challenges of our times. According to the WHO, more than 1.9 billion adults (18 years and older) globally are overweight and about 650 million of these individuals are obese.[1, 2, 3] The medical and psychological sequelae of obesity contributes to a large proportion of current health-care expenditures leading to negative economic impact through loss of worker productivity, increased disability and premature loss of life. According to the 2017 Public Health England report, the annual spend of over £16 million on the treatment of obesity and diabetes is greater than the amount spent on the police, the fire service and the judicial system combined.[4, 5] It is estimated that by 2035 the increasing rate of diseases associated with obesity would cost the NHS an extra £2.5 billion per year.[6] Obesity results in various clinical manifestations such as Type 2 diabetes mellitus (T2DM), hypertension, cardiovascular diseases (CVD), visual problems, nerve impairment and renal failure. In addition, obesity may result in low self-esteem and despondency. Most complications related to obesity are long-term with no curative treatment, thus resulting in a significant detrimental effect on the Health-Related Quality of Life (HrQOL) of the individual.

Material and Methods

Selection Outline

This literature search analysed the factors that influenced and/or contributed to obesity in both children and adults. The literature was systematically analysed using a three-stage methodology of the following scientific databases: PubMed, Scopus, Google Scholar, CINAHL, EMBASE and Cochrane reviews. Established and well-recognised News and Health Service websites such as the BBC and NHS were used to obtain recent information that is not yet published in a scientific journal. To ensure that the sources I used were reliable and had sufficient scientific objectivity, I decided to use ***CAPOW*** (Currency, Accuracy, Purpose, Objectivity and Writing Style) criterion to evaluate them**.** This allowed for the most relevant and up-to-date literature to be analysed.

Analysis of Database Selection

The well-regarded and peer-reviewed databases such as PubMed, Scopus, Google Scholar, CINAHL, EMBASE and Cochrane reviews, along with

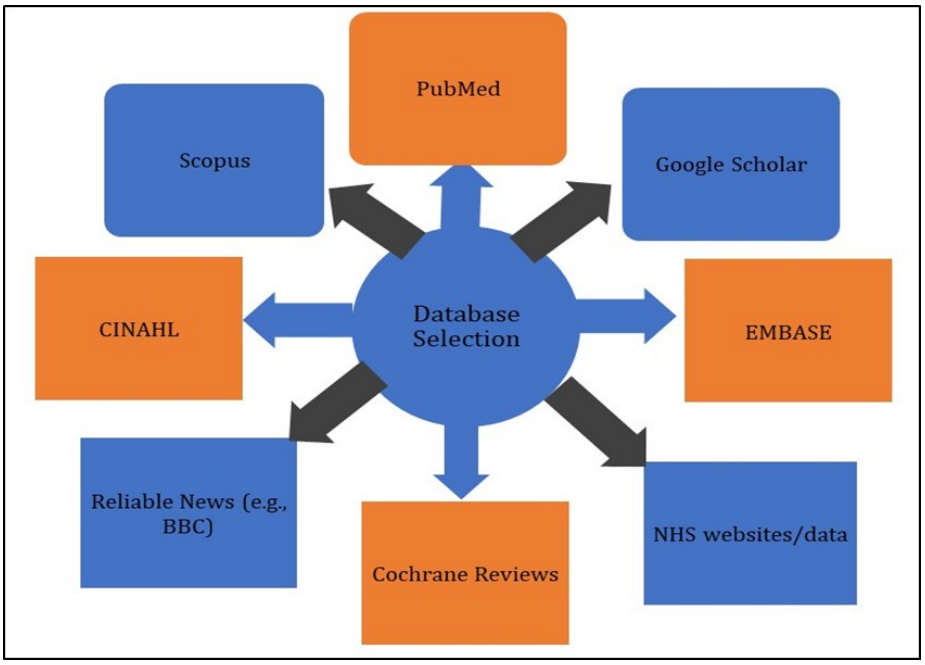

***Figure 1**: Summary of Databases Selected to Conduct Literature Search*

established News and Health Service websites such as the BBC and NHS, were considered ***(Figure 1)***.

An initial basic search about the topic was performed. PubMed has a strong filtering system as well as a 'See Related Citations' feature, which enables a wider study of the topic. Scopus, one of the largest citation database of peer-reviewed literature, has advanced filtering features, which is useful when narrowing down the results. Although Google Scholar has a limited ability to filter the search, the large number of publications in its repository allows a broad reading of the topic and covers a longer time-period. The records CINAHL provided were mostly citations and an author-provided abstract of the article but the full-text was available only for selected journals. Hence this database was not considered further. EMBASE, an Elsevier database available through subscription, was not used since all articles were available on PubMed. Cochrane review was used but no information was found in the search (due to a paucity of randomised controlled trials on this topic) and, therefore, not useful in the literature search. A criteria-based selection process allowed a short-list to be created by selecting the most appropriate literature ***(Figure 2)***.

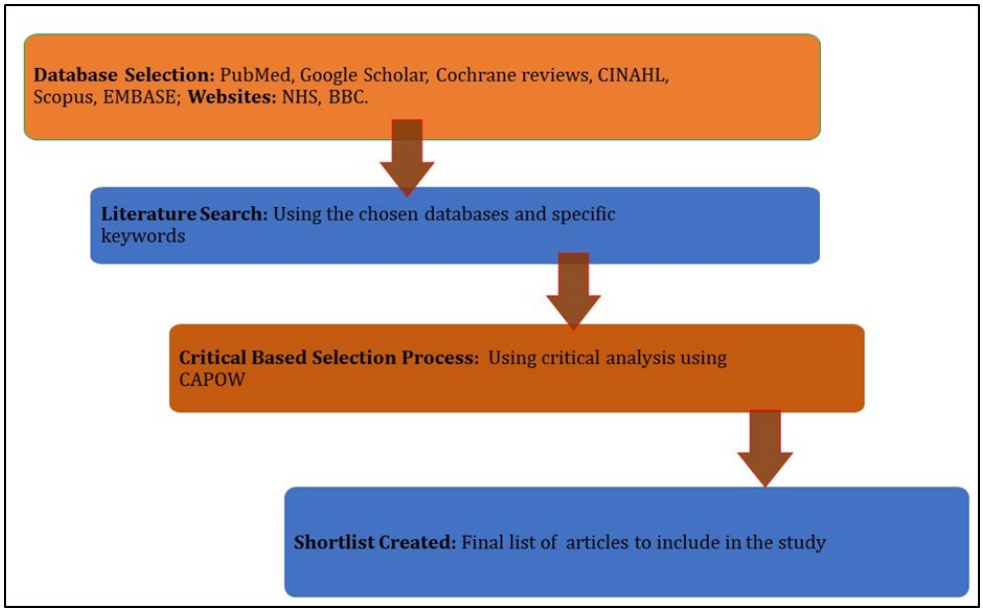

***Figure 2**: Overview of Methodology*

Literature Search

During the initial search, it became apparent that a plethora of information was available regarding the general topic of diet and obesity, and its associated complications and morbidities. This resulted in an unexpectedly large number of 'hits' during the literature search. In order to narrow down the relevant information, the chosen scientific databases were used to conduct a literature search using the key words *'income and obesity', 'education and obesity', 'childhood obesity and causes', ethnicity and obesity', 'immigration and obesity', 'genetic factors and obesity' and 'current research in genetics and obesity'* ***(Table 1)***.

Table 1*: Number of Results for Research Topics*

Number of results from key words: CASE 1	Scopus	PubMed	Google Scholar
Ethnicity and lack of exercise	11,000	48,800	117,000
Ethnicity and migration	12,500	37,800	125,000
Genetic factors and obesity	24,400	678,000	1,230,000
Education levels and obesity	26,900	1,050,000	1,660,000
Income and obesity	11,700	213,000	611,000
Current research in genetics and obesity	18,500	377,000	1,020,000

Results

Ethnicity and Lack of Exercise

Majority of the UK population is White Caucasian (87%), followed by people of Black Caribbean, Black African, Indian, Pakistani, Mixed and Bangladeshi descent. The prevalence of obesity among Black children aged 10–11 is about 30% compared to about 18% in Caucasian children ***(Figure 3)***. This disparity may be due to certain social factors, such as ethnic minority children engaging in lower levels of physical activity compared to their Caucasian peers. [7, 8, 9] Recent research (2019) published by Cambridge Scholar at the Centre for Diet and Activity Research (CEDAR) in the Medical Research Council (MRC) Epidemiology Unit at the University of Cambridge indicated that factors such as limited access to or the cost of participating in sports, parents working long and unsociable hours, and low socioeconomic status might influence this. Likewise, a combination of personal beliefs, socioeconomic, cultural and environmental barriers has been thought to discourage people from Black and other minority ethnic groups from engaging in physical activity. According to National Obesity Observatory, South Asian women report barriers such as dress codes and limited amount of single-sex facilities impede their physical activity. Likewise, studies have identified that some South Asian women have negative attitudes to physical activity instilled by their parents or grandparents who view sports and femininity to be incompatible. [10, 11] These views might be propagated to the future generations.

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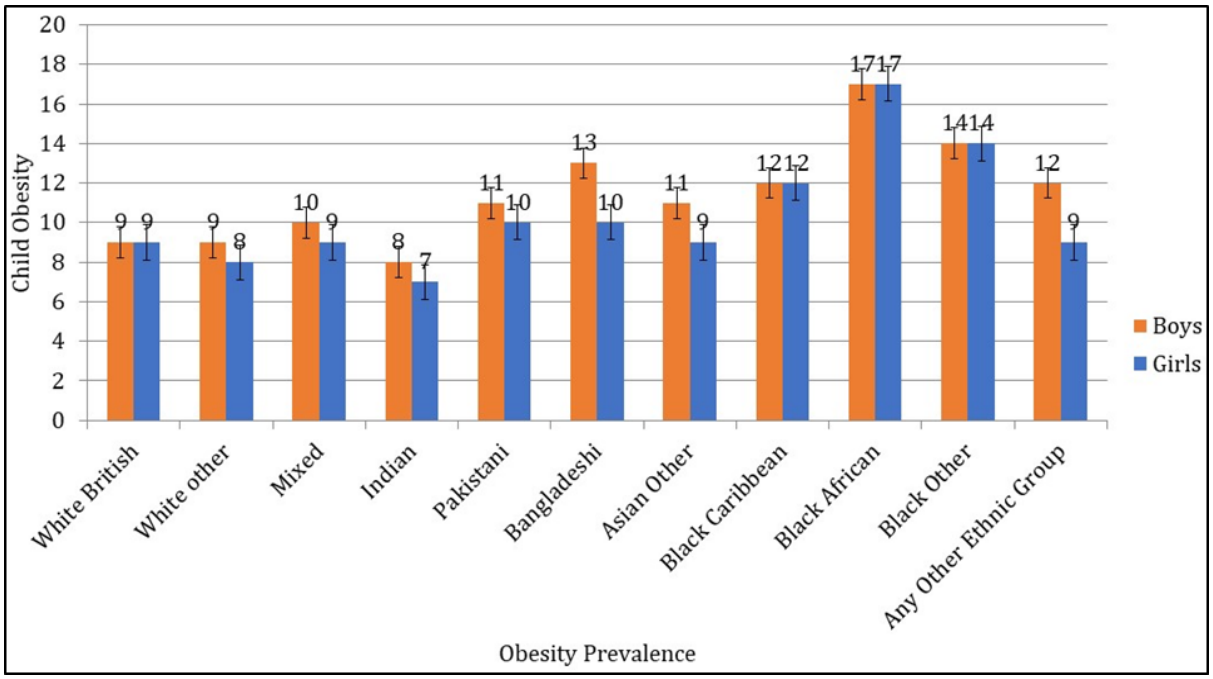

***Figure 3**: Obesity Prevalence Amongst Different Ethnicities in the UK* [12]

Ethnicity and Migration

Research has identified that African-Americans have lower rates of lipolysis than Caucasians.[13, 14] Likewise, they may possess lower levels of adiponectin (a hormone that regulates glucose levels and fatty acid breakdown) during childhood and adolescence. This might explicate their increased preponderance towards T2DM and CVDs.[15] Migrant children are at higher risk of becoming overweight and obese due to acculturation and lifestyle changes: migrants tend to abandon their traditional food habits and adopt westernized dietary patterns containing high levels of fat, sugar and salt. In addition, migrants coming from developing countries may have a cultural preference for larger body sizes, as they are considered to be signs of good health and wealth. This may lead to the parents being unconcerned about their children becoming overweight or obese.[16] ***Figure 4*** illustrates the relationship between migration and obesity in American population.

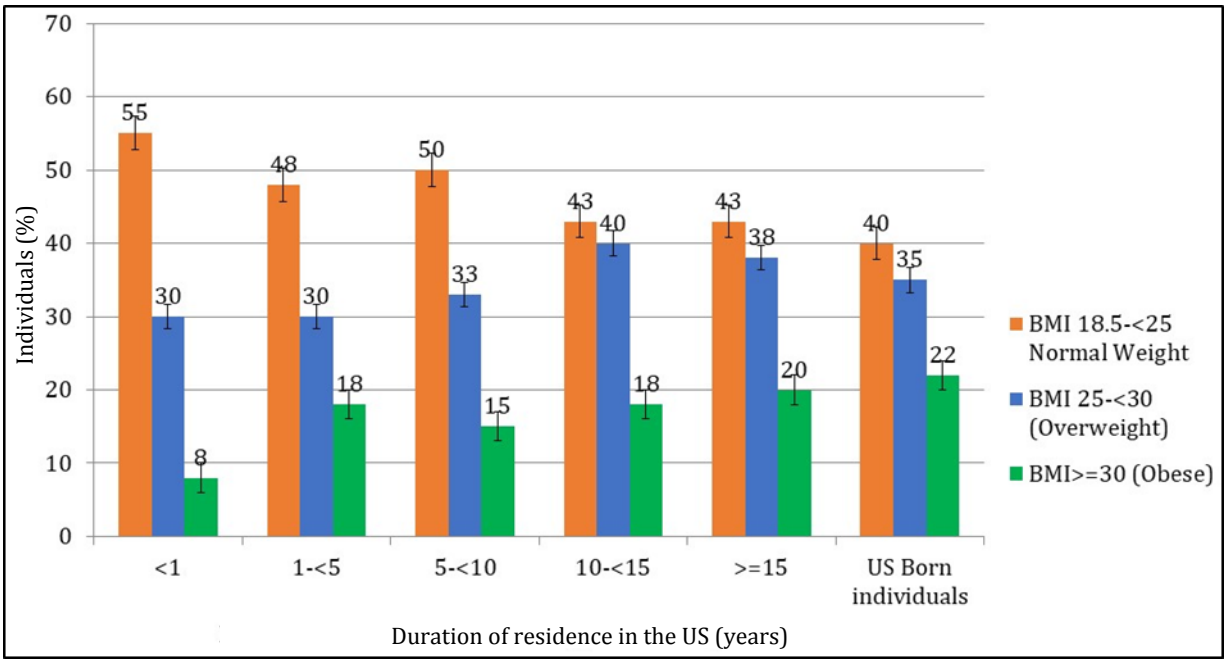

***Figure 4**: Graph depicting the relationship between the Duration of residence in the US (Migration) and Obesity*[17]

Genetic Factors

Correlation has been established between an individual's genetic make-up and the risk of developing obesity. In 2010, Silventoinen and colleagues undertook a global study to determine the genetic and environmental influences on both twin and adopted children up to the age of 18 years.[18] They identified that the BMI of adopted children correlates strongly with biological parents and less with adoptive parents, thus corroborating a genetic predisposition.[18] About 50 obesity-associated genes loci have been identified, with both monogenic (5%) or polygenic (95%) inheritance patterns. In monogenic obesity, genes such as *FTO, PCSK1, MC4R, CTNNBL1* code for the proteins regulating the appetite and satiety centres cause pathological alterations, resulting in obesity.[19] Likewise, mutations in the polygenic genes inhibit the leptin-melanocortin pathway that regulates the energy homeostasis. Single Nucleotide Polymorphisms (SNPs) that occur on the first intron of the FTO gene, which is associated with fat mass and obesity, can result in a higher adiposity and, thus, obesity.[20] In 2016, Silventoinen and colleagues studied 88,000 twins (both monozygotic and polyzygotic) to understand the effect of genetics and the environment on BMI.[18] They concluded that the genetic factors could be influenced by environmental factors (such as availability of high calorie food, lack of exercise and social poverty).[21]

Role of Gut Microbiomes

Changes in the microbes of the gut (bacteria that influence the absorption of nutrients and the inflammatory responses of the body) could be associated with a higher risk of developing obesity.[22] The composition of microbiomes depends on the host, but it can also be modified by exogenous and endogenous factors. In infants, perinatal antibiotic exposure (destroys native gut flora), method of childbirth (vaginal birth is advantageous) and antibiotic usage during the first 2 years after birth could result in changes to the microbiomes. This can result in inefficient absorption of nutrients, altered regulation of fatty acid tissue composition and induce low-grade inflammation. In adults, excessive use of antibiotics can adversely affect the gut microflora that normally have a beneficial effect on digestion and absorption of nutrients. This can result in impaired metabolism and malabsorption of essential minerals and vitamins in the long-term.

Discussion

Health behaviours of a population can be influenced by geography, culture, ethnicity and socioeconomic factors. The incidence of obesity related complications such as T2DM and CVD differs in the various ethnic groups. Individuals from certain ethnic minorities in the UK often have lower socioeconomic status, which, in turn, can contribute to obesity especially in children and women (due to the difference in metabolism causing a greater increase in levels of fatty acids in blood and menopause affecting fat distribution).[23, 24, 25]

Sedentary lifestyle is also a major predisposing factor for the development of obesity and its associated morbidities. Study by Williams *et al*., (2010) has shown that, in the UK, individuals from South Asian population or descent have lower levels of physical activity.[11] The stigma that follows being obese leads to lack of confidence and low self-esteem. This could translate into these individuals not being able to get employment, thus continuing to remain within the low socioeconomic group. Minority ethnic groups tend to have greater levels of unemployment, experience less social mobility, lower income which causes them to reside in deprived areas within the UK. Migrants, refugees and asylum seekers from countries such as Congo, Somalia, Afghanistan and Eritrea face a high degree of exclusion form the job market.

In order to achieve health equity and to eliminate health disparity, the Government should strategically plan policies that are achievable and practical. Some recommendations include producing linguistically appropriate materials through inclusion of cultures and values that are specific to these ethnic minorities.[26] Another recommendation includes training individuals from these minorities to be 'community health ambassadors' for their community wherein they will be able to communicate with their own people and spread the knowledge and awareness regarding the importance of physical activity and good health.

Genetic or epigenetics (heritable phenotypic changes that do not involve alterations in the DNA sequence) cannot fully explicate the rapid rise in global obesity since the pool of different genes across a population remains fairly stable for many generations. It takes a long time for new mutations or polymorphisms to develop and manifest in a population. The answer is most likely in our societal factors: the physical, social, political, and economic surroundings that influence how much we eat and how active we are. Environmental changes that have made it easier for people to overeat and harder to get enough physical activity have played a key role in triggering the recent surge of overweight and obesity.[27] In 2008, for example, Andreasen and colleagues demonstrated that physical activity offsets the effects of one obesity-promoting gene, a common variant of FTO. The study, conducted in 17,058 Danes, found that people who carried the obesity-promoting gene and who were inactive had higher BMIs than people with the same gene variant

but were active. Although research on obesity-related gene-environment interactions is fairly recent and thus conclusive evidence limited, the indication so far suggests that genetic predisposition does not play a significant or proven role as many individuals who carry the so-called "obesity genes" do not become overweight. Consuming a healthy diet and getting enough exercise may counteract some of the gene-related obesity risk.

Ongoing Research

The leptin-melanocortin pathway is important to trigger the satiety centre in the hypothalamus. Absence of such inhibition leads to a desire to binge eat, increased feeling of hunger and polyphagia (increase intake of food).[28] In 2019, a team led by Professors Farooqi at the Welcome Trust-MRC Institute of Metabolic Science in Cambridge studied over half a million UK volunteers and found that MC4R can control the motivation for food in association with a brain reward system by 'switching the centre on-off' following eating through beta-arrestin pathway.[29] In obese individuals, the genetic variation is 'switched on' such that the individual consumes more calories than required. This is a breakthrough research and is thought to be a powerful aid in developing safer and effective treatment options for weight loss therapies.[30]

Dr Langenberg (2019) identified a genetic link between higher plasma glycine levels, and an increased incidence of T2DM and CHD. It is postulated that high levels of plasma glycine are associated with a higher blood pressure, thus reducing the risk of CHD. The study identified 27 genetic loci and concluded that glycine is genetically associated with higher CHD risk, possibly by increasing the blood pressure. They also found a strong association between genetically predicted hyperinsulinemia and higher levels of glycine (observed association between higher glycine and higher incidence of T2DM), and the glycine-T2DM association may be driven by a glycine-lowering effect of insulin resistance. Further understanding of the genetic link to glycine pathway could pave the way for novel treatment strategies to treat T2DM and CHD.

Future Directions

With continued advances in technology, micro-informatics and data analytics, there will be rapid strides in determining the role of genetics and epigenetics to determine the causation of obesity. Studies involving identical and biological twins might glean more information on the effect of nature and nurture in influencing obesity. Currently, there's a dearth of randomised controlled or blinded studies in the field of obesity and, thus, statistically significant objective evidence is limited. In might be beneficial to consider such studies in the future. Likewise, when undertaking population-based studies, it would be beneficial to carry out longitudinal or Cohort studies that follow a set of children through their development to see the impact of different contributing factors to obesity. Finally, when analysing studies in a structured manner as in a meta-analysis, it would be judicious to consider studies carried out in different parts of the world comprising a diverse population.

Conclusion

The prevention and treatment of obesity require commitment and collaboration of all relevant stakeholders at an individual, community, national and international levels.

Targeted education, behavioural changes and environmental approaches may be effective in promoting healthy lifestyle habits. For individuals to maintain these positive traits over longer periods of time and to have a long-lasting impact that negates an obesogenic environment, governments, industries, health care professionals and community members must consider the prevention of obesity to be of high priority. Specific strategies and delivery methods for the prevention and control of obesity at home, school, workplace, and healthcare settings should be established. Since factors such as genetic influence, hormonal variations, gut microbiomes, ethnicity and geographical migration are beyond an individual's control, at present, it might appear futile to influence this predisposition. However, with further advances in genetics, epigenetics and genomics, as well as novel technological developments, a more robust strategy may be implemented to target and attenuate some of these innate factors.

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