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Dear Readers,

Welcome to the 2016 issue 1&2 of FORIM JOURNAL.

We regret that due to restructuring of Forum of Industry Medicine the issues were delayed and we had to combine some of them. We sincerely hope that we will be able to bring out our future publications in time.

This issue has articles which are demand of the day as we are exposed to news onslaught on doctors being manhandled by patient's relatives and a wave of litigations against them.

Dr D N Upasani, is a Medical specialist and a Law graduate, with expertise in laws related to medical profession. His article on litigations against doctors is meant to sensitise the doctors and also advise them how they can avoid such litigations.

Dr Ramandeep Singh Gambhir and Dr Samir Anand have given an insight on awareness amongst doctors about CPA in their original study. It is a very interesting article.

Dr Sandeep Sharma Medical Advisor and HSE manager at IOCL informs on the best practices being followed in IOCL on Occupational Health and Emergency Medical Services.

Liver disease being on the rise due to unhealthy Lifestyle in todays generation prompted us to add some articles on Nutrition in Chronic Liver diseases and Fatty liver. Dr Banani Jena tells us about role of Vit D3 in COPD.

Dr A Prakash, Former Prof of National Academy of Indian Railways, has contributed an article on medical textile. Our readers in clinical practise will find it interesting as it dwells on importance of specialised textile and economics involved.

Overall, I feel you all will find this issue different and interesting due to the content and their contribution to enhance knowledge on less treaded path..

Regards,

Dr V K Ramteke
President, FORIM and
Editor-in-Chief, FORIM Journal
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Dr Jain’s original research work on “Knee prosthesis sizes in Indian patients undergoing total knee replacement” has been published by “International Journal of Surgery” UK in August 2015.
Dr Pankaj Kapoor
Treasurer FORIM

DR C R Sarma Member FORIM gets Railway Week Award 2016
Dr V K Ramteke President FORIM nominated as member of Governing Body, Delhi College of Arts and Commerce, Delhi University
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Joined Indian Railway Medical Service and worked on Central Railway
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Headed Medical Department OF South Eastern Railway Kolkata and of
Central Railway Mumbai as Chief Medical Director of respective Railways.

After retirement from Railways headed 130 beds Charitable Hospital at
Ghatkopar, Mumbai for 17 years.

Actively involved in the activities of Lions Clubs International & was elected as
District Governor 323D & Council Chairman Multiple District 323.
LITIGATION IN MEDICAL PROFESSION...... HOW TO AVOID

Dr D. N. UPASANI

Every citizen is required to observe the laws of the land. Medical profession is not an exception. If a patient or a relative feels that he has suffered an injury at the hands of a doctor, he may go to any of the following for a relief:

Medical Council of India
Consumer Protection Act
Civil Laws under Law of Contracts or under Law of Torts
Criminal Laws

Medical Council of India
MCI and State Medical Councils are established under the Act of Parliament. They have framed rules for conduct of doctors & for medical education. Doctors are required to be registered under a Medical Council and are bound to follow the rules.

CPA
The Act was passed in 1986 to protect a common man from the wrongs done by powerful and unscrupulous businessmen, contractors, service providers and to arrange for payments and compensation. While enacting the Act it was not supposed to cover medical profession. Gradually, the medical profession also came under its ambit and as per the landmark judgement IMA v/s V P Shanta (1999) given by Supreme Court, it is now fully under the CPA.

Civil Laws
Breach of Contract and the loss sustained because of the same is compensated by the Civil Law of Contract.

Law of Torts is a Civil wrong independent of contract where a formal contract does not exist and compensation for the loss is ordered by the courts.

In the Civil Laws object is to arrange for compensation for losses and there is no concept of punishment.

Criminal Laws
All unlawful acts, prohibited by the law and the society are tried under criminal law. Cognisance of such an offence is taken by the state and the case is registered as State v/s the person. The aim is not to pay compensation to the sufferer but to punish the wrongdoer.

It would be shocking to know that a medical person could be tried under any of the following sections of Criminal Law.

Section 202 – Intentional omission to give information as an offence. Failure to give information about medicolegal / accident cases.
Section 269- Negligent act likely to spread infection. Not informing the cases of a notifiable diseases to authorities.
Section 304A- Death caused by any rash or negligent act by the doctor (but not amounting to culpable homicide)
Section 304- Culpable homicide not amounting to murder. Here the act is done with the knowledge that it is likely to cause death.
Section 302- Murder. Here the death is with intention (mens rea)
Section 312-316 - These sections cover the provisions of MTP Act of 1971
Section 319-323 – Deals with the issue of hurt. Whosoever causes, bodily pain, disease or infirmity to a person, is said to have caused hurt.

For a doctor it is important to take consent of the patient for every procedure. Here the principle of “Volunti non fit injuria” comes into play. Otherwise even touching a patient to examine him or her amounts to hurt.

Section 340-347- Deals with wrongful restraint and confinement. For medical profession it applies to not discharging a patient or not handing over a dead body for non-payment of hospital dues.

Section 491- Deals with the breach of contract, to attend on and supply of wants, to a helpless person. In medical profession discharging a patient who is still not well or leaving treatment midway attracts the provision of this section.

Section 499- Deals with defamation. Defamation of colleagues as well as disclosing the details of illness of a patient attracts this section.

Medical Ethics:

In addition to all above, a doctor is also bound by Medical Ethics.

Doctors are expected to conduct their profession in the most ethical way. This granted them a position of “Semi GOD” or “Next to GOD”. For centuries there were no litigations. With passage of time and introduction of commercialisation in medical profession the profession has been reduced to a “service provider” status.

Once the doctor is a service provider, there can always be deficiency in services, services not proportionate to the charges paid or be negligent and hence the medical profession has started facing litigations.

Deficiency in Services or medical negligence:

Any fault, imperfection or any shortcoming in the quality, potency or standards, which is required to be maintained in any law (civil, criminal, cooperative, labour, CPA, MTP Act etc.) is deficiency of service.

Negligence is also defined as ’Not doing” what is required to be done (Act of omission) or “doing” what is prohibited to be done (Act of commission).

Rashness:

Undertaking an assignment beyond ones competence or doing something which no sane or sober person in similar circumstances would ever do.

For medical professional negligence could also be defined as breach of duty owed by the doctor to his patient, to exercise reasonable care and skills, resulting in some mental, physical or financial disability.

When negligence is breach of duty, the following duties have been listed by MCI, which if not carried out, amounts to negligence:

1. To Listen to the patient’s complaints and history and ask him relevant questions.
2. To examine the patient thoroughly.
3. To explain to the patient about his illness, seriousness, different modes of treatment available, risks involved, possible side effects etc. in simple language which the patient can understand.
4. To investigate fully and confirm diagnosis.
5. To refer the patient to higher centres, senior specialists when disease is beyond the limits of knowledge, skills or experience of the treating doctors.
6. To take adequate care of the patient once the treatment is started.
7. To continue to treat the patient once the treatment is started. Doctor cannot leave the treatment midway.
8. To foresee complication of the disease and side effects of the treatment and to take measures to overcome them
9. To prescribe correct good quality medicines and explain to the patient the doses and precautions to be taken
10. To keep necessary equipment and gadgets in working conditions
11. To keep knowledge updated
12. To keep records of history of illness, clinical notes, investigation reports and advice given. Though the records are confidential it is mandatory to supply the copies of records to the patient or near relatives on receiving written request for the same.
13. To inform the Police all medicolegal cases and to inform concerned authorities all notifiable diseases.

While the doctor is duty bound as above and breach of any one of them is treated as negligence, doctor does have some rights as follows:

1. Doctor has the right to select his patient. He is not bound to treat every person who comes to him. He should undertake treatment as per his knowledge, experience, availability of equipment, staff and other facilities for treatment
2. He may refuse to treat a patient who is already under treatment of some other doctor
3. Doctor may treat a patient in emergency (on humanitarian ground) and advise the patient to go to some other doctor or hospital for further treatment
4. Doctor may refuse to treat a patient who does not agree to the line of treatment offered.
5. Doctor has right to choose any one of the many standard lines of treatment.
6. Doctor can delegate some of his work to his assistant who is qualified to do it. He is however vicariously responsible for the action of his assistant
7. Doctor can take assistance of a senior specialist while treating his patient
8. Doctor can refuse home visits. However, he is expected to visit patient who is under his treatment and whose condition is worsening.

Though, a doctor is answerable under various laws and though litigations are on an increase, the situation is not so gloomy. Right thinking persons in the society and judiciary, by and large, is supportive, if the doctor is doing their profession ethically. The law has appreciated and stated that no doctor would like to harm his patient or do a negligent act as even the doctor’s reputation is at stake.

Bolam’s rule is an established principle in the medical profession. Justice McNair in Bolam vs Friern Hospital has established that doctor needs to exercise ordinary skills and knowledge as possessed by an average competent man and any outstanding knowledge or special skills is not expected out of the treating doctor. Doctor cannot be held negligent if he does not exercise such special or outstanding skills or knowledge.

Doctor is not expected to be infallible. Unfortunate results can be there inspite of a doctor being very careful and knowledgeable.

Doctor has the liberty to select any school of thought while planning his patient’s treatment when multiple schools of thought are available for treating a particular disease. He cannot be questioned on why he did not select some other school of thought for treatment and hence cannot be held negligent for not selecting some other way of treatment.

Landmark Supreme Court judgement delivered by Bench headed by The Chief Justice of India Mr
Lahoti, in the case Jacob Mathew vs State of Punjab has clearly stated that a patient with advance cancer is likely to die inspite of due care by the doctor and the hospital and such case cannot be a case of Negligence.

Justice Katju and Justice R M Lodha, of Supreme Court, in a case of Dr Martin D'souza vs Mohammad Ishtaq upheld the decision of the treating doctor for using a particular antibiotic (though it had severe side effects) due to the specific condition of the patient and ruled that the decision to use that antibiotic cannot be considered rash or negligence.

Supreme Court in Jacob Mathew case categorically ruled that the trial court and investigating authority, in a private complaint, should not arrest the doctor, unless a credible opinion from an independent specialist is taken and a prima facie case is established.

**How can we PREVENT litigations?**

Indeed there should be no fear of getting involved in litigation.

Even today patients and the relatives are not interested in blaming doctors or to go for litigation. They have faith and respect for the doctor. However, today patient and relatives are more smart, observant, inquisitive and well informed due to internet. They, therefore, want to know what is happening.

By a survey it is established that in majority of litigations the major single cause is rude, rough and inhuman behaviour of the doctor and staff. JUST AVOID IT. Train yourself and the staff to be polite and show empathy.

Doctor does not take any interest in listening to patient’s complaint (mostly busy on mobile). Listen to the patient carefully, attentively, show interest, ask questions.

Doctor does not want to talk to relatives, avoids them. Be proactive and talk to them. They may or may not be genuinely interested in patient’s wellbeing, but they deserve to be listened to and talked to in either situation. You will have to take the patient and relative into confidence.

Examine the patient in detail. Female patients should be examined in presence of female relative and a nurse. Examine previous papers, investigation etc. and discuss the treatment plan with them. Inform them of different treatment plan available for the ailment and reason for your selecting a particular plan. Make them to participate in decision making.

Give them correct hopes and assurances. Be realistic instead of being pessimistic or over enthusiastic and assuring 100% cure.

Take informed consent in presence of an independent witness. These days doctors prefer to video record the discussion and consent taking.

Condition of the patient should be discussed daily with the relatives about patient’s improvement or deterioration. In case unfavourable outcome is expected, it should be informed to them and discussed well in advance to avoid sudden shock. Take their suggestions and offer them permission to take second opinion of any senior specialist or shift patient to a higher centre.

In case of a sad outcome the treating doctor himself should break the news. Do not ask the nurse or a junior doctor to do so. Share the grief of the relatives and develop interpersonal relations.

Issue certificates in right formats. Never give incorrect or bogus certificates. Never change or manipulate medical records. Never criticise your colleagues.

Always, be a knowledgeable and competent doctor. Be good at heart with empathy for the patients. Follow all rules and regulations. Fulfil your moral and ethical obligations.

YOU WILL NEVER FACE ANY LITIGATION IN YOUR WHOLE LIFETIME.

‘May God bless you with such an immunity’
KNOWLEDGE AND AWARENESS OF CONSUMER PROTECTION ACT AMONG PRIVATE DENTISTS IN TRICITY, PUNJAB

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ABSTRACT

Background: Consumer Protection Act (CPA) aims to protect the interests of the patients in case of any unethical treatment rendered by a medical or a dental health professional. The present study was conducted to assess knowledge and awareness of CPA among dental professionals in a Tricity in India.

Materials and Methods: A cross-sectional study was conducted among 265 private dental practitioners in Tricity. A close-ended self-structured questionnaire was administered which contained 15 questions on knowledge and awareness regarding CPA. Categorization of knowledge scores was done at three levels—low, medium and high. Statistical analysis was done using ANOVA and Student t test.

Results: 54.7% (145) of subjects were having low knowledge scores, 23.3% (62) had a medium score and 21.8% (58) had a high score. Mean knowledge score according to educational level was statistically significant (P<0.05), whereas there was no significant difference in case of gender and type of practice (P > 0.05). Conclusion: The results of the present study showed that majority of the subjects were aware of the existence of CPA but knowledge regarding basic rules and regulations was lacking in few studies. Therefore, dental professionals need to keep them updated of various rules and latest amendments to save themselves from any litigation.

Keywords: Awareness, consent, Consumer Protection Act, dental profession, knowledge

Introduction

The medical profession is a vocation in which the knowledge and skills are used for the service of the people. Our society has placed doctor next to god.¹ The doctor–patient relationship relies on the mutual trust and conviction.² The sole objective of a doctor is to improve the quality of life of the people and mitigation of sickness and suffering. The medical profession is a service-oriented liberal profession having a self-regulating code of ethics.³

A dental health professional has a dual responsibility toward individual patient and as well as the society.³ This special status that society confers on the dental health care professionals requires them to behave in an ethical manner. This responsibility should be at the core of the dental professional’s ethical behavior.⁴ However, with an increase in commercialization in all spheres of life, this profession has come under public scrutiny.

Earlier the role and the service provided by the medical and dental professional were considered
noble and charitable. But today with the increase in medical negligence and malpractices this profession is looked upon with doubt and contempt. Monetary gains have led to the deterioration in the standard of patient care and moreover patients are becoming more aware of their rights. A comprehensive piece of legislation called “Consumer Protection Act (CPA)” was implemented in 1986 in India for the better protection of the interests of the consumers. It aims to provide a forum to safeguard the rights of the customers and establishes guidelines for the speedy redress of their grievances against unethical medical practices. All the services rendered by any medical or dental health care professional are covered under CPA except when the service is provided free of cost, especially in charitable or governmental dispensaries and hospitals and primary health centers. The courts have great responsibility to punish the guilty doctors and at the same time to protect the honest doctors from undue harassment at the hands of patients. Therefore, it becomes imperative for all health care professionals (including dentists) to be aware of such laws that will be valuable for patients, health care professionals and the community as a whole. Moreover, studies on knowledge and awareness among dental health professionals about laws related to the CPA have rarely been reported in literature, hence the present study was undertaken to

- Report on knowledge and awareness level regarding CPA among dental health professionals in Tricity (Chandigarh, Panchkula and Mohali) and
- Suggest possible measures to increase knowledge among dental professionals if required.

Materials and Methods

Ethical clearance and informed consent
The present study was conducted after obtaining ethical clearance from the Institutional Review Board of the college. Written informed consent was obtained from the participants before data collection and prior permission was obtained from the concerned college authority.

Study population and study sample
The present descriptive cross-sectional study was carried out among dental health professionals who are engaged in private practice in the Tricity (Chandigarh, Panchkula and Mohali). List of practicing dentists was obtained from local Indian Dental Association bodies. A pilot study was done on 25 subjects to check the feasibility of the study. The required sample size was determined based on the results of the pilot study. After doing all the calculations, a sample size of 255 was obtained. By adding 10% of the non-responders, a total sample of 280 was obtained. Simple random sampling was done in order of select the study participants from the Tricity.

Research instrument
The instrument for the study was a self-made questionnaire written in English language which was made specifically for the study. The questionnaire was handed over to each of the study participants. The questionnaire was pre-tested for validity and reliability and modified accordingly. The reliability of the questionnaire was good (0.85). The questionnaire was divided into two sections—Section A was “General section” containing socio-demographic details of the participants. Section B comprised of 15 close-ended questions based on the awareness, applicability, objectives etc., of CPA [Figure 1]. Questionnaire was handed over to all the respondents by the investigator and later on
collected from them. Incomplete questionnaires were not included in the study. Total knowledge/awareness score was calculated on the basis of each participant’s response. Each positive response was scored as “1” and negative as “0.” The total score was a simple sum of responses ranging from 1 to 15, the answers of which were graded on a 15 point Likert Scale. Categorization of scores was done at three levels—low (0–5), medium (6–10) and high (11–15).

Statistical analysis
The present study conducted descriptive statistical analysis. Number and percentages were used to compute results on categorical measurements. Results were statistically analyzed using SPSS package version 15.0 (SPSS, Chicago, IL, USA). Analysis of Variance (ANOVA) was employed to find the significance of study parameters between three or more groups of participants and Student’s t-test was used to find significance between two groups. The significance was set at <0.05.

Results
Excluding the non-responders and incomplete questionnaires, the final sample size consisted of 265 private dental practitioners with a response rate of 94.6%.

Socio-demographic characteristics
The details of the participants regarding gender, level of education and type of practice are mentioned in Table 1. A number of male subjects (175, 66%) were comparatively more as compared to the female subjects (90, 34%). Also, majority of
the subjects were graduates (153, 57.7%) and were doing combined practice (173, 65.2%) as compared to postgraduates and only private practitioners, respectively.

Response to questions
Subjects’ response to various questions regarding CPA is depicted in Figure 1. More number of postgraduate subjects (68%) were aware regarding location of consumer courts in their area as compared to graduate subjects (22%). Only one fourth (24%) of graduate subjects gave correct answer regarding maximum compensation that can be claimed by a patient as compared to postgraduate subjects (54%). Interestingly more than 50% of subjects agreed to the fact that consent should be regularly taken in practice. Approximately three fourths (74.7%) of postgraduate subjects responded correctly regarding the type of consent to be relied upon.

Knowledge/awareness level
Among the study participants, 54.7% (145) were having low knowledge scores, 23.3% (62) had a medium score and 21.8% (58) had a high score [Table 2]. When education level of the study participants was compared with knowledge regarding CPA, it was seen that 60.1% of the graduates Bachelors of Dental Surgery were having low knowledge scores and only 15.6% had high scores. Astonishingly, only one third (30.3%) of the postgraduates Masters of Dental Surgery were having a high knowledge scores [Figure 2]. Mean knowledge scores according to different socio-demographic profiles are summarized in Table 3. Mean knowledge score according to educational level was statistically significant ($P < 0.05$) whereas there was no significant difference in case of gender and type of practice ($P > 0.05$).

Table 1: Socio-demographic characteristics of study subjects

<table>
<thead>
<tr>
<th>Characteristics</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender</td>
<td>175</td>
<td>66</td>
</tr>
<tr>
<td>Male</td>
<td>90</td>
<td>34</td>
</tr>
<tr>
<td>Female</td>
<td>85</td>
<td>32</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>153</td>
<td>57.7</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>112</td>
<td>42.2</td>
</tr>
<tr>
<td>Type of practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>92</td>
<td>3,4</td>
</tr>
<tr>
<td>Combined (private+academic)</td>
<td>173</td>
<td>65.2</td>
</tr>
</tbody>
</table>

Table 2: Knowledge levels regarding CPA among study participants

<table>
<thead>
<tr>
<th>Knowledge level</th>
<th>Number of participants</th>
<th>Percentage of participants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low</td>
<td>145</td>
<td>54.7</td>
</tr>
<tr>
<td>Medium</td>
<td>62</td>
<td>23.3</td>
</tr>
<tr>
<td>High</td>
<td>58</td>
<td>21.8</td>
</tr>
<tr>
<td>Total</td>
<td>265</td>
<td>100</td>
</tr>
</tbody>
</table>

CPA: Consumer protection act
Table 3: Mean oral health literacy of study participants according to different socio-demographic variables

<table>
<thead>
<tr>
<th>Socio-demographic variable</th>
<th>Knowledge score</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Standard deviation</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>4.94</td>
<td>2.54</td>
</tr>
<tr>
<td>Female</td>
<td>5.42</td>
<td>2.29</td>
</tr>
<tr>
<td>Total</td>
<td>5.14</td>
<td>2.59</td>
</tr>
<tr>
<td>Education level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Graduate</td>
<td>4.67</td>
<td>2.43</td>
</tr>
<tr>
<td>Postgraduate</td>
<td>5.78</td>
<td>3.46</td>
</tr>
<tr>
<td>Total</td>
<td>5.37</td>
<td>2.76</td>
</tr>
<tr>
<td>Type of practice</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private</td>
<td>3.23</td>
<td>2.62</td>
</tr>
<tr>
<td>Combined</td>
<td>6.54</td>
<td>3.86</td>
</tr>
<tr>
<td>Total</td>
<td>5.54</td>
<td>2.22</td>
</tr>
</tbody>
</table>

P<0.05 (Statistically significant). Tests used=Student t-test, ANOVA.

Discussion

Nowadays, patients have become more aware of their rights supplemented by modern legislation that has made the society increasingly compensation-oriented. CPA has been formulated to be customer friendly, as there is no court fee payment, the person can plead their own case, and the decision is taken within 3–6 months.[9] The present study was conducted on knowledge and awareness regarding CPA among private dental practitioners in a Tricity in India. The study utilized a closed-ended questionnaire in order to accumulate important information regarding CPA from the subjects which is evident from the results. Such types of questionnaires reduce recall bias and such questions are easy to analyze and may achieve quicker response from the subjects. Moreover, the authors have tried to gather vital information regarding CPA from the subjects. For this reason, the questionnaire used in the present study was framed after consulting specialists and other studies done on the subject.

Comparatively more number of subjects were engaged in private practice as compared to subjects doing combined practice (academic and private) in the present study. This finding is in contrast to some other study conducted in another city of India.[10] Moreover, number of female private practitioners were almost half as compared to number of male private practitioners in the present study. The collective reasons behind this could be family or domestic commitments (caring for children), increasing competition in private practice and more inclination toward academic or teaching jobs.[11]

More than 50% of the subjects in the present study had low knowledge scores regarding CPA and in this more than 60% were graduates and 47% were postgraduates. This might be due to deficiency in the Indian educational system which doesn’t have much information on CPA in theory and its applicability in detail in the dental curriculum either in the under or post-graduate, both in formal and informal ways.[12] The only information which a dental practitioner gathers regarding CPA is through newspapers and mass media.

There has been increase in the number of compensation cases that are being brought against doctors in recent years.[13,14] In the present study, very few subjects had knowledge regarding maximum compensation that can be claimed by the patient which is in accordance to some other study findings.[15] This indicates the lack of complete understanding about CPA among dental professionals.

In the present study, postgraduate dental practitioners had a higher knowledge as compared to graduate dental practitioners regarding CPA (P = 0.026). This is in accordance
with couple of studies conducted in Ghaziabad and Udaipur, India in which postgraduate dental professionals were more knowledgeable as compared to graduates.\textsuperscript{10,15} This might be due to the reason that with increase in knowledge, awareness also increases. Moreover, knowledge level was more in females as compared to males in the present study, which is in contrast to some other study reports.\textsuperscript{16} This could be due to the fact that males comparatively devote more time toward their clinical practice than females.

It is a general, legal and ethical principle that one must get valid consent before starting any treatment. It was reported in the present study that almost half of subjects agreed to the fact that consent should be regularly taken in private practice and informed consent is the most reliable type of consent. This may be due to the higher chance of the patients seeking treatment from the dental professionals tends to claim compensation in case of mishap or negligence. This is in contrast to some other study finding in which lesser number of subjects were taking informed consent.\textsuperscript{17}

However, there are certain limitations worth mentioning. First of all, our study is a cross-sectional study with relatively small sample size and hence it is difficult to generalize the findings for the entire country. Since it was a questionnaire study, knowledge and awareness regarding CPA among respondents may or may not be predicted, reflecting the inherent limitations of such studies. Further studies are warranted to investigate the knowledge, attitude and awareness pertaining to the CPA by some better tools. It is also emphasized that studies comparing the knowledge of dental with medical professionals should also be conducted.

**Conclusion and Recommendations**

The results of the present study that majority of the subjects were aware of the existence of CPA. However, basic awareness regarding rules and regulations about CPA was found to be low among both the graduate and postgraduate subjects. Therefore, dental professionals need to update their knowledge and understanding on CPA and its amendments to be on a legally safer side. Following recommendations are put forth-

- Compulsory continued medical education (CME) programs on CPA should be arranged frequently
- Awareness should be spread about professional indemnity claim
- Dental professionals should internalize quality-assured health standards in their routine professional duties, to ensure protection of customer rights.

**References**


Dr SANDEEP SHARMA
SENIOR MEDICAL PROFESSIONAL
Medical Advisor HSE Management  Hospital Management
In the Oil & Gas Sector, Power Sector, Infrastructure Sector & Chemical Industry.

CAREER SUMMARY
✓ Technically accomplished Medical Specialist with over 15 years' rich experience in Medical Management, Medical Advisor, Health, Safety & environment Management with Indian Oil Corporation Ltd (IOCL).
✓ Astute Medical Manager with a flair for adopting modern hospital project execution methodologies, systems in compliance with quality standards.
✓ Expertise in Occupational Health and Safety Management System.
✓ Strong Relationship Management, Communication skills with the ability to network with Hospitals and Medical Specialists and Occupational Health Physicians.
✓ Presently heading Health Section of Corporate HSE Department of IOCL, responsible for monitoring, budget control, setting maintenance standards, providing expert services to all the Eight Refineries of IOCL. In addition to this, also responsible for formulating the Safety, Health and Environment Policy of IOCL and also coordinating the Health, Safety, & Environment efforts of all the Divisions at Corporate level.

SIGNIFICANT ACCOMPLISHMENTS
✓ Headed the Occupational Health Services, Emergency Medical Services and Surgery Department of Mathura Refinery Hospital of IOCL as Deputy Chief Medical Officer for around twelve years.
✓ Implemented TPM (Total Productive Maintenance) concept in Mathura Refinery Hospital (First among all IOC refineries).
✓ Headed the committee for establishment of Paradip Refinery Hospital of IOCL.
✓ Shouldered responsibility of implementing Corporate Health Projects across all Divisions of IOCL.
✓ Spearheaded the implementation of various projects such as Nutritional Evaluation of Dietic arrangements of Canteens/kitchens from health and hygiene point of view at all locations across IOCL.
✓ Involved in revision of Corporate Occupational Health Manual of IOCL. Contributed significantly as a Key Core Commissioning Member during commissioning of the Occupational Health and Hospital Management System software across IOCL.
✓ Formulation & Issue of guidelines on Health, Safety & Environment and ensure implementation of the same.
✓ Ensure implementation of Occupational Health Systems and procedures in all refinery units, marketing and pipeline installations.
✓ Upgradation of Occupational Health System in IOCL in line with international norms and standards.
✓ Planning, organizing and conducting advanced training programmes on Occupational Health & Safety.
✓ Published IOCL Corporate Health Manual on Guidelines on Healthy Lifestyle, Nutrition & Occupational Health.
✓ Published IOCL Corporate Health Manual on Managing Stress and Health at Workplace.
✓ Planning, organizing and conducting Lectures on Healthy Lifestyle, Corporate Health and Nutrition, Stress management, Management of Diabetes and Dyslipaedimia through Diet, First aid, Medical Emergency Response Planning, etc.
INTEGRATING OCCUPATIONAL HEALTH & SAFETY THROUGH EFFECTIVE OCCUPATIONAL HEALTH PROGRAM

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MBBS MS AFIH
Senior Manager Corporate HS&E
Indian Oil Corporation
E-mail: sandeeparul@rediffmail.com

Aim
Occupational Safety & Health of employees is an essential pre-requisite for productivity and economic development of an Organization. Indian Oil Corporation has taken a series of initiatives to ensure safe and healthy working conditions for employees. Aim of the study was to strengthen and streamline the Occupational Health & Emergency Medical Services across the Corporation.

Materials and methods
As per Corporate Occupational Health Manual, Occupational Health Services (OHS) audit of Indian Oil Refinery units was conducted by a two member inter Refinery audit committee consisting of doctors from Refineries. This exercise of audit of OHS was conducted, to strengthen and streamline the performance of the Occupational Health (OH) services/facilities across the Corporation and to achieve international standards in Occupational Health.

1. **First Aid Centre (Ambulance room)** was observed. Whether First Aid Centre was adequately equipped with trained manpower, equipment and facilities to tackle all types of medical emergencies like
   - Occupational trauma, intoxications, burns, accidents etc. and
   - Non-occupational emergencies—myocardial infarction, bronchial asthma, syncope attacks, epilepsy etc.

2. **Provision of dedicated communication facility** which can be activated in the event of fire/Accident in Refinery like a hot line from fire station or at least an alarm bell system

3. **Prominent display of Siren Protocol** for Accident/Disaster

4. **Drug register** showing quantity/ date of expiry, checked and signed by the nurse/doctor at regular intervals

5. System of daily check of emergency drugs, oxygen cylinders and other resuscitation equipment

6. Record of daily check of the refrigerator showing temperature, working condition, appropriate placement of drugs

7. Proper record of illnesses and injuries of personnel reporting to FAC (separately for employees and contract employees)

8. Whether updated record of ‘at-risk’ hazardous materials used or produced at the worksite, Updated version of Material Safety Data Sheets - for acute exposure management
9. Record of daily check of housekeeping

10. First Aid Boxes
   - Each unit/installation shall provide and maintain First aid boxes equipped with prescribed content, readily accessible during all working hours. Nothing except the prescribed contents shall be kept in a first-aid box or cupboard.

11. What % of employees is identified for FA training?

12. Ambulance Van
   - An ambulance van, equipped as mentioned in the Corporate OH Manual should be available, manned by full time driver cum mechanic and a helper trained in first aid for the purpose of transportation of serious cases of accidents or sickness.

13. Training in BLS (Basic Life Support)(CPR-Cardio Pulmonary Resuscitation)

14. Disaster Management Plan (DMP)
   - Emergency preparedness plan Functional Organ gram in case of disaster situation Details of facilities available at nearby hospitals
   - Are Triage guidelines incorporated and training imparted to employees

Corporate Occupational Health Meet is conducted every year where Occupational Health performance of Units is reviewed with deliberations for further strengthening of Occupational Health services across the Corporation based on audit observations. Areas of improvements are identified and the recommendations for improvements sent across the Corporation for uniform implementation.

Third Issue of Corporate Occupational Health Manual was released during the Corporate Occupational Health meet.

First Issue of Standard Operating Procedures in Occupational Health Services was released by Director Refineries.

These Manuals, further elaborated and incorporated the Occupational Health related systems & procedures, for strengthening and uniform working of Occupational Health & Emergency Medical Services across the Corporation.

Occupational Health & Wellness Index was implemented across the Corporation to further reinforce these targeted efforts.

Results
The purpose of the study for establishing Occupational Health & Emergency Medical Services management frame-work in the organization helped us to – align OHS objectives with business objectives of our organization, integrate OHS programmes / systems into the business systems, establish a logical framework upon which to establish an OHS program, devise a set of effective policies, targets, programs and procedures, provide an auditable reference for performance benchmarking, and establish a continual improvement framework.

Conclusion
Periodic and Systematic review of Occupational Health & Emergency Medical Services helps in strengthening them to ensure safe and healthy working conditions for employees. Hence establishing an “Effective Occupational Health Program” helps to integrate Occupational Health & Safety and leads to safe & healthy workplaces.
ROLE OF VITAMIN D₃ IN COPD PATIENTS

Dr BANANI JENA MD Physician
Associate professor, Dept. of Pulmonary Medicine
IMS & Sum Hospital, Bhubaneshwar.

Vitamin D deficiency is a global health problem. Over a billion people worldwide are vitamin D deficient or insufficient. There are two forms of vitamin D, Vitamin D2 (ergocalciferol) and D3 (cholecalciferol). Vitamin D status depends on the production of Vitamin D3 in the skin under the influence of ultraviolet radiation from the sun and vitamin D intake through diet or vitamin D supplements. Vitamin D3 deficiency can result in obesity, diabetes, hypertension, depression, fibromyalgia, chronic fatigue syndrome, osteoporosis and neuro-degenerative diseases including Alzheimer’s disease. Vitamin D deficiency may even contribute to the development of cancers, especially breast, prostate, and colon cancers.

Patients with COPD are at high risk of vitamin D deficiency due to lower food intake, reduced synthesis with skin aging, lack of outdoor activity and sun exposure, increased catabolism by glucocorticoids, impaired activation because of renal dysfunction, and a lower storage capacity in muscles or fat due to wasting.

Vitamin D deficiency is prevalent among patients with COPD and comes to be more frequent with increased disease severity. In participants with severe vitamin D deficiency at baseline, supplementation may reduce exacerbations. According to a recent meta-analysis, the benefits of supplementation were only present when baseline 25-OHD levels are very low (<10 ng/ml). Nevertheless, because large cross-sectional data suggest that muscle strength continues to increase from 25-OHD levels of 9 ng/ml to 37 ng/ml, it can be speculated that the beneficial effects on the muscle are only seen when higher doses of supplementation are given. And it is found that there is a significant improvement in dyspnea, respiratory muscle strength and physical performance without parallel improvement in pulmonary function tests like FEV1 and FVC after supplementation of vitamin D over 1 year and decreased the frequency of exacerbation in severe COPD patients with vitamin D deficiency.

Vitamin D may also have a role in several diseases involving the respiratory system such as asthma, chronic obstructive pulmonary disease, cystic fibrosis, and respiratory infections. Vitamin D may also have a role in several diseases involving the respiratory system such as asthma, chronic obstructive pulmonary disease, cystic fibrosis, and respiratory infections.

Chronic obstructive pulmonary disease (COPD) is a major cause of morbidity and mortality across the globe. According to World Health Organization estimates, 65 million people have moderate to severe COPD. More than 3 million people died of COPD in 2005 corresponding to 5% of all deaths globally and it is estimated to be the third leading cause of death by 2030.
Especially patients with lung diseases have often low Vitamin D serum levels. Epidemiological data indicate that low levels of serum Vitamin D is associated with impaired pulmonary function, increased incidence of inflammatory, infectious or neoplastic diseases. Several lung diseases, all inflammatory in nature, may be related to activities of Vitamin D including asthma, COPD and cancer. The exact mechanisms underlying these data are unknown, however, Vitamin D appears to impact on the function of inflammatory and structural cells, including dendritic cells, lymphocytes, monocytes, and epithelial cells.

**Figure 1 Metabolism and effects of Vitamin D.**

Many steps of the Vitamin D pathway (intake, synthesis, storage, and metabolism) can potentially be disturbed in COPD patients.

The mechanisms that link Vitamin D biology with the development of COPD are largely speculative:

1. **The association of Vitamin D deficiency and reduced lung function could depend on the calcemic effects of Vitamin D.** The vital capacity and total lung capacity was found to decline with an increasing number of thoracic vertebral fractures as a direct consequence of Vitamin D deficiency.

2. **Vitamin D deficiency could result in altered host defense of the lung with subsequent growth of an abnormal flora that triggers inflammation.** Acute exacerbations of COPD are an important cause of hospitalization and lead to a faster decline in FEV1.

3. **The effect of Vitamin D on extracellular matrix homeostasis not only in bone tissue, but also within the lung may have a role in COPD development.**

Vitamin D has a number of activities in addition to its effect on calcium and bone homeostasis and influences process such as immune regulation, host defense, inflammation, or cell proliferation. Vitamin D deficiency is potentially involved in a number of lung disease. Supplementation of vitamin D is ever important to decrease the frequency of exacerbation in severe COPD patients with vitamin D deficiency.

**References:**


Liver disease occurs worldwide in those with excessive alcohol consumption and those who are obese with or without added effects of insulin resistance. Fatty liver disease (FLD) also occurs in several metabolic and genetic conditions that influence fatty acid metabolism.

**Hepatic steatosis.**

Both Alcoholic Fatty Liver Disease (AFLD) and Non-Alcoholic Fatty Liver Disease (NAFLD) generally begin as hepatic steatosis, and if the cause persists, this steatosis invariably progresses to steatohepatitis, cirrhosis, and liver cancer. Hepatic steatosis represents an excess accumulation of fat (triglycerides) in hepatic parenchymal cells (hepatocytes) of the liver, and it occurs in etiologically diverse conditions. Morphologically, hepatic steatosis manifests as accumulation of large (macro vesicular) or small (micro vesicular) intracytoplasmic fat droplets in liver parenchymal cells. The diagnosis of steatosis is made when lipid content in the liver exceeds 5–10% by weight. Hepatic steatosis is mostly macro vesicular in type in the alcoholic, obese, and diabetic states as well as in certain malnutrition states, such as kwashiorkor and acquired immune deficiency syndrome.[1]

Changing your lifestyle and diet can help improve your liver function. Here are things you can do to help improve NAFLD:[2]

- lose weight
- decrease intake of saturated fats and avoid trans fats
- eat healthy fats, especially Omega-3 fats
- increase fiber intake
- decrease your intake of sugar and high fructose or high glucose containing beverages
- Increase activity.
- Strictly avoid drinking, smoking and drug abuse. **Weight loss is the most important change you can make to reduce fat in the liver.**

**Weight loss plan which can be followed by NAFLD patients**

Weight loss and exercise are the most effective treatments for NAFLD. It does not take a large amount of weight loss. Studies have shown that losing up to 10% of your weight can improve your liver enzyme levels and decrease the amount of liver fat.

A healthy weight loss is 0.45 to 0.9 kg per week. Rapid weight loss can worsen the fatty liver. To lose the 0.45 to 0.9 kg of weight you need to burn 3,500 calories. To do this in one week you need to burn or decrease your caloric intake by 500 calories per day.

Here are 2 key points to include in your weight loss plan:[2]

1. **Eating a well-balanced and healthy diet.**
   The kind of foods you eat and how much you eat can affect your weight.
2. Move your body.

Being physically active is also important. **Eat a well-balanced and healthy diet**

Include foods from at least 3 of the 4 food groups to make sure you are preparing a balanced meal. This will help you to get all the vitamins, minerals and other nutrients you need to keep your body healthy.

Choose the lower number of servings a day for each food group to decrease the amount of calories you are eating.

Include foods high in fiber (such as vegetables and legumes) and healthy fat choices (such as fish, poultry, lean meat, eggs, and low fat dairy products) in your meals and snacks to help you feel full longer.

### Grains and Grain Products – 6 to 8 servings a day

<table>
<thead>
<tr>
<th>Foods group guidelines</th>
<th>How much is one serving?</th>
<th>Say YES to</th>
<th>Say NO to</th>
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<tbody>
<tr>
<td>Choose grain products that are low in fat, sugar or salt.</td>
<td>1 slice bread 30 g cold cereal or 3/4 cup hot cereal ½ cup cooked rice, pasta and cereal</td>
<td>Whole grain breads, hot and cold cereals, pasta, brown rice. Low fat snack foods such as air popped popcorn.</td>
<td>Commercial baked goods, such as cakes, pies, donuts and croissants. High fat snack foods such as potato chips and cheese</td>
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### Vegetables and Fruits – 7 to 10 servings a day

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<tr>
<th>Foods group guidelines</th>
<th>How much is one serving?</th>
<th>Say YES to</th>
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<tbody>
<tr>
<td>Eat at least one dark green and one orange vegetable each day. Enjoy vegetables and fruit prepared with little or no added fat, sugar or salt. Have vegetables and fruit more often than juice.</td>
<td>cup raw, leafy vegetable such as spinach ½ cup fresh, frozen, or canned vegetables or fruit 1/2 cup vegetable or fruit juice 1 medium sized piece of fruit</td>
<td>All, except coconut and battered or deep fried vegetables.</td>
<td>Coconut Battered or deep fried vegetables.</td>
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</table>

### Milk and Alternatives – 2 to 3 servings a day (*MF- Milk Fat)

<table>
<thead>
<tr>
<th>Foods group guidelines</th>
<th>How much is one serving?</th>
<th>Say YES to</th>
<th>Say NO to</th>
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</thead>
<tbody>
<tr>
<td>Drink skim, 1% or 2% milk each day. Select lower fat milk alternatives, such as 20% MF or less cheese, and 0% MF yogurt.</td>
<td>1 cup milk or fortified soy beverage 3/4 cup yogurt 1 ½ Oz low fat cheese</td>
<td>Skim or 1% milk, yogurt, cottage cheese Lower fat cheese (less than 20% MF) Low fat ice cream (1% MF), frozen yogurt (2%MF), sherbet Fortified soy beverages</td>
<td>Full fat milk and dairy products</td>
</tr>
</tbody>
</table>
## Meat and Alternatives – 2 to 3 servings a day

<table>
<thead>
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<th>Foods group guidelines</th>
<th>How much is one serving?</th>
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<tbody>
<tr>
<td>Eat at least 2 Food Guide servings of fish (with Omega 3 fat) each week. Select lean meat and alternatives prepared with little or no added fat or salt. Have meat alternatives such as beans, lentils and tofu often.</td>
<td>2 ½ Oz cooked meat, poultry or fish. 2 eggs. 1/4 cup nuts or seeds 3/4 cup cooked legumes 2 tbsp. peanut butter.</td>
<td>Lean cuts of meat with visible fat trimmed off such as strip loin or round. Skinless chicken or turkey. Egg whites or substitutes. Omega 3 fish, especially fatty fish such as salmon, sardines, trout, whitefish, herring, and mackerel. Peas, beans and lentils Soy based meat alternatives such as tofu and textured vegetable protein (TVP) Omega 3: flaxseeds, walnuts, soybeans and tofu.</td>
<td>Deep fried chicken wings or battered fish. Meat with visible fat. Chicken or turkey with skin. Organ meats, liver, kidney. Regular luncheon meat, bacon, sausage or hot dogs. More than 3 egg yolks each week.</td>
</tr>
</tbody>
</table>

## Fats and Oils - 2 servings a day

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<tr>
<th>Foods group guidelines</th>
<th>How much is one serving?</th>
<th>Say YES to</th>
<th>Say NO to</th>
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<tbody>
<tr>
<td>Healthy fats. Use unsaturated fats, such as olive oil, canola and vegetable. Limit intake of processed foods.</td>
<td>30 to 45 ml (2 to 3 tsps.) total amount of unsaturated fats and oils a day.</td>
<td>Omega 3: canola oil and soybean oil or margarines made with these oils: soft, non-hydrogenated margarine olive, canola, soybean, peanut and other vegetable oils. Salad dressings such as oil and vinegar or low fat.</td>
<td>Regular sauces and gravies. Cream cheese, creamy salad dressings and full fat mayo. Butter, cream, lard and shortening. Coconut or palm oil.</td>
</tr>
</tbody>
</table>

Diet plays a role in the pathophysiology of NAFLD. It is reasonable to advise patients with NAFLD to reduce calorie intake with either low-fat or low-carbohydrate diets as well as limit intakes of fructose, trans-fatty acids, and saturated fat. [3]

**References:**
The study on the trends of Chronic Liver Disease in a Tertiary Care Referral Hospital in India stated that Chronic Liver Disease (CLD) due to alcohol showed a significant rising trend with early age (mean 48.4 years) and high percentage of decompensated disease (75%) and high early mortality (63%).

Prevalence of malnutrition:
Malnutrition has significant implications for liver transplantation; it has been shown that patients with poor nutritional status before transplantation have increased complications and higher mortality rates postoperatively. Malnutrition is highly prevalent among patients with chronic liver disease and is nearly universal among patients awaiting liver transplantation. Protein-calorie malnutrition (PCM)—a condition of body wasting related to dietary deficiency of calories and protein—is found in 65–90% of patients with advanced liver disease and in almost 100% of candidates for liver transplantation. Patients with chronic liver disease also frequently develop micro nutrient deficiencies, which can have a more insidious presentation than the overt cachexia seen in patients with PCM.

Consequences of malnutrition:
Malnourished patients with cirrhosis have a higher rate of complications such as esophageal varices, hepatic encephalopathy (HE), hepatorenal syndrome, impaired liver function and regeneration capacity and increased surgical morbidity and mortality. Malnutrition has significant implications for liver transplantation; it has been shown that patients with poor nutritional status before transplantation have increased complications and higher mortality rates postoperatively.

Etiologies of Malnutrition:
The primary etiology of malnutrition is poor oral intake, stemming from multiple factors. Many patients with advanced liver disease have an altered sense of taste, which might be related to vitamin A and/or zinc deficiency. Patients with cirrhosis often experience early satiety that is related to mechanical compression from massive ascites. In addition, weakness, fatigue, and low-grade encephalopathy can contribute to decreased oral intake.

Malabsorption is another important factor in the development of malnutrition in this patient population. A number of mechanisms contribute to malabsorption. There might be a reduction in the bile-salt pool in patients with advanced liver disease, leading to fat malabsorption, which is particularly problematic in patients with cholestatic liver disease.

Goal of nutrition therapy:
The goals of nutritional therapy are to improve PCM and correct nutrient deficiencies. This can be accomplished via oral, enteral, or parenteral methods, or a combination of these modalities. Intervention in the early stages of malnutrition can improve outcome.

As a general guideline, oral intake should be
encouraged; if patients are unable to maintain adequate intake orally, a nasogastric tube should be used for enteral feeding. In severely malnourished patients with cirrhosis, enteral feeding improved serum albumin levels and decreased in-hospital mortality rates, compared with the standard oral diet.

**Nutritional recommendation by ESPEN guidelines:**

EN by means of ONS is recommended for patients with chronic LD in whom undernutrition is very common.

- **Type of formula:** concentrated high-energy formulae in patients with ascites to avoid positive fluid balance. Use BCAA-enriched formulae.
- The use of oral BCAA supplementation can improve clinical outcome in advanced cirrhosis.
- A low protein intake was associated with a worsening of encephalopathy whereas a normal protein intake (1 g/kgBW/d) was associated with an amelioration.
- Use tube feeding if patients are not able to maintain adequate oral intake.

**Alcoholic steatohepatitis (ASH) Liver cirrhosis (LC) Transplant**

<table>
<thead>
<tr>
<th></th>
<th><strong>Alcoholic steatohepatitis (ASH)</strong></th>
<th><strong>Liver cirrhosis (LC)</strong></th>
<th><strong>Transplant</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Energy kcal/kg BW/d</strong></td>
<td>35–40</td>
<td>35–40</td>
<td>30–35 for maintenance</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>35–45 for malnourished patients</td>
</tr>
<tr>
<td><strong>Protein g/kgBW/d</strong></td>
<td>1.2–1.5</td>
<td>1.2–1.5</td>
<td>0.8–1.0 in compensated liver disease</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>1.5–2.0 decompensated liver disease</td>
</tr>
<tr>
<td><strong>Fat</strong></td>
<td></td>
<td></td>
<td>25%–40% of calories Consider moderate amounts of MCT oil when steatorrhea present</td>
</tr>
</tbody>
</table>

Oral supplementation is the best choice for nutritional intervention in any population. Early satiety, anorexia, dysgeusia, nausea, diarrhea, or a combination of these symptoms may preclude a liver transplant candidate from achieving adequate oral dietary intake. Tube feeding is indicated for malnourished patients who have a functional gastrointestinal tract but are unable to ingest adequate nutrition orally.

**Reference:**

6. Hasse J; The Benefits of Nutrition Therapy in the Liver Transplant Patient
A Technical textile is a textile product manufactured for non-aesthetic purposes, where function is the primary criterion.

It is a large and growing sector and supports a vast array of other industries.

Technical textiles include textiles for automotive applications, medical textiles (e.g., implants), geotextiles (reinforcement of embankments), agrotexiles (textiles for crop protection), and protective clothing (e.g., heat and radiation protection for fire fighter clothing, molten metal protection for welders, stab protection and bulletproof vests, and spacesuits).

Over all, global growth rates of technical textiles are about 4% per year greater than the growth of home and apparel textiles, which are growing at a rate of 1% per year.

Classification

Technical textiles can be divided into many categories, depending on their end use. The classification developed by Techtextil, Messe Frankfurt Exhibition GmbH is widely used in Europe, North America and Asia[1]. The classifications are:

- Agrotech (Agro-textiles)
- Mobitech (Automotive and aerospace textiles)
- Buildtech (Construction Textiles)
- Clothtech (Clothing Textiles)
- Geotech (Geo-textiles)
- Hometech (Domestic Textiles)
- Indutech (Industrial Textiles)
- Medtech (Medical textiles)
- Mobiltech (Textiles used in transport)
- Oekotech or Ecotech (Environmentally-friendly textiles)
- Packtech (Packaging textiles)
- Protech (Protective textiles)
- Sporttech (Sports textiles)
- Medtech (Medical textiles)

These are the textiles are functionally appropriate for use in medical, health and hygiene products. Clearly not every textile can be used. Nontoxic, nonallergic, noncarcinogenic and sterilizable without physical or chemical change are some of the desirable properties. Durability, low linting and absorbancy are also important. These include wound dressings, sutures, implants, personal hygiene products and dresses & bed linen etc.

Increasing Use

The market size of medical textiles was 3600 – 3700 crore in 2014 and it is increasing at the rate of 8%-9% per year and expected to go upto 15% per year. This is to be seen in back ground of the increasing size of health care industry (8% of GDP) increasing at the rate of 17%-20% per year. Factors forcing this acceleration are –

- Increasing population
- Changing demography – more people needing health care
- Rising income
- Innovations – more & varied products to use
Awareness & Attitude
This market is split into Surgical Dressings/Wound Care 45% (about 1000 cr), Sutures 18% (about 500 cr), Implants 9% (about 250 cr), Disposables 1%-2% (about 50 cr) and Diapers & Napkins etc about 1500 cr. Implants are the fastest growing segment at about 16%.

This should be compared with the world market (without hygiene products) of about four billion dollars.

Types & Manufacture
In brief the manufacturing process can be represented as –

Raw Material → Fiber → Yarn → (Processing) → Fabric → Textile Medical Product

Raw Material – Raw material can be natural (cotton, recently bamboo etc), synthetic (polymer – PET, PTFE) or now biomaterial/biopolymer like chitin. Synthetics offer a greater control over properties like capillary action, absorbancy, inertness or hydrophilic/hydrophobic tencency.

Processing – It can involve braiding (for sutures & cords), knitting, weaving or nonwoven processes (spunbonding, meltblowing etc). Each process imparts different qualities. For instance woven fabric are dimensionally very stable but less extensible unravel at edges when cut. Knitted fabric are very flexible, have high porosity and do not unravel when cut.

Nonwovens are a class apart, are in use since world war II and rapidly getting more & more popular. The properties depend upon the the constituent fiber or polymer and the bonding process. Natural ingredients like cotton or wood pulp give good absorbancy, breathability and biodegradability. These are also easier to launder and sterilize. Polymer as ingredient makes it stronger, more hydrophobic and economical. Thus their uses are also multifarious.

Classification
Medical textiles have been variously categorised as Implantable, Nonimplantable, Hygiene products and protective & healthcare products. Global Harmonising Task Force has also suggested classification in categories – I / IIa / IIb / III. But here I am presenting a different classification –

<table>
<thead>
<tr>
<th>Class</th>
<th>Rationale - Biocontact</th>
<th>Example</th>
<th>Requirements</th>
</tr>
</thead>
<tbody>
<tr>
<td>In the Patient</td>
<td>Days to Months</td>
<td>Sutures, Implants</td>
<td>Biocompatible, Nontoxic, Nonallergenic, Highly Sterile</td>
</tr>
<tr>
<td>On the Patient</td>
<td>Minutes to Hours</td>
<td>Swabs, Dressings</td>
<td>Nontoxic, Nonallergenic, Sterile</td>
</tr>
<tr>
<td>Near the Patient</td>
<td>Nil. Only ordinary contact</td>
<td>Cap, Mask, Gown</td>
<td>Sterile, Lint free</td>
</tr>
<tr>
<td>For the Patient</td>
<td>No contact</td>
<td>Wrap for sterilization</td>
<td>Clean</td>
</tr>
</tbody>
</table>
In general all should have properties of strength, durability, elasticity, fire resistance and antistatic. Unfortunately there are not many standards prescribed by BIS which is leading to availability of poor quality products. Drugs and Cosmetic Act also requires suitable modifications.

Some New Concepts

This field is also subject to rapid innovations.

Antimicrobial Textile – The fiber itself may be antimicrobial (antimicrobial added to polymer itself), after formation the fiber may be treated with antimicrobial or the fabric itself may be so treated at finishing stage. The properties may differ. Use of silver as antibacterial through nano technology is often heard of.

Spray on Fabric – Small fibers are suspended in polymer and a volatile solvent. Colour pigments, chemicals or antiseptics can be also added. It is totally seamless and can have significant uses in dressings (specially burns) and as surgical drapes etc.

Textile Scaffolding – It is being used in stem cell therapy for tissue/organ regeneration.

Bioglass fibers – Its use is in the area of orthopaedic surgery.

Final Words

Cost is always a major issue in our country. But on per use basis the disposables base on nonwoven medical textiles may prove cheaper. For instance a cloth OT cap good for ten uses will cost about Rs 35.00 (material & stitching) and will cost about Rs 15.00 for 10 wash & autoclave cycles (@ Rs 1.50 per cycle). Average cost per use comes to about Rs 5.00 as against Rs 2.00 – 3.00 per disposable cap of nonwoven fabric.

But will the quality be as good? It is difficult to say so in absence of mandatory standards. Also the reusable products have a superior quality during first few uses which deteriorates to average on repeated use.

Lastly we must consider the environmental issues involved. If used, arrangements for proper disposal are must. I was unable to find any study comparing the carbon load of the two options.

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