

Review Article

Status of Radiation Safety and Emerging Challenges in Radiology in Nepal Calling for Strong Safety Measures

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Abstract

Nepal is a poor country with low expenditure on health care and limited resources in Radiology field. However, radiology service is improving with several up-to-date diagnostic and radiotherapy facilities, the quality assurance and radiation safety are still lacking in Nepal. Lack of proper radiation policies, qualified work force and awareness of the uses of radiation energy are the major issues of radiology in Nepal. Around 400 radiographers are available in Nepal who is working under the pressure of high patients load. Due to lack of men power, more than 100 unqualified persons without a proper radiography education are working for radiographers. These unqualified radiographers unknowingly use high doses of radiation energy and working under a high risk of radiation hazard. Provisions of radiation protection for staffs, patients, and public around are very poor in Nepal. Most of the X-ray clinics are running without minimum requirements of quality assurance and radiation protection. More than 50% of the populations of Nepal do not understand benefits and hazard of radiation energy. The international atomic energy agency (IAEA) has urged the Government of Nepal to enact nuclear law and establish an Atomic Energy Commission to deal with nuclear issues. Although, Nepal is an IAEA member, the Government has not yet given a serious focus on radiation issues. The purpose of this article is to explore the current situation and alert for urgent need to improve and develop the infrastructure of radiology field in Nepal for quality assurance and safety facing emerging mountainous challenges.

INTRODUCTION

Nepal is a poor country lagging behind in all most all aspects of technologies including the health care system [1-3]. Annual per capita health expenditure is around 29 US \$. The expenditure on health care is also low accounting 5.5% of the government budget. The curative sector is funded with 49% of the health budget [1,4,5]. Radiology service in Nepal is poor, particularly in government hospitals because of inadequate funding compared to other curative sectors.

The radiation energy is utilized mainly in medical field including diagnostic and radiotherapy sectors in Nepal, but to some extent, also utilized in agriculture and industrial fields. This article is mainly on utilization of ionizing radiation energy in medical field. Although Nepal has achieved a steady progress in radiology in the past two decades despite the enormous

shortage of radiology resources, worst socio-economical and serious political conditions [1,6]. The main radiology recourses are limitedly available in private and government hospitals mostly at Kathmandu valley and major cities [1,2,6,7]. However, the government and private sector investments are beginning to improve the facilities, the quality assurance and radiation safety for patients, staffs and public around are still lacking in most of the centers. It is due to lack of proper radiation policy, adequate workforce, advance facilities, proper local environment, and maintenance back up, and awareness of the benefits and hazards of radiation energy. The present status of the above mentioned issues of radiology practice have not been studied previously, which remain virtually unknown for Nepal [1,3,6]. It may be hard to understand for the radiology professionals of developed countries how lucky are they, until know how their colleagues from developing countries are working to deliver even the need

based radiology services to the public despite the emerging mountainous challenges. The purpose of this article is to not only serve as a source of information about the current status of radiology practice in Nepal, but also to explore the possibilities to improve and alert for urgent need to develop the infrastructure of radiology field in order to provide safe and quality radiology service in future facing emerging challenges.

Current scenario of radiology practice in Nepal

With the advancements in radiology imaging and radiotherapy resulting improved patient safety and the quality of care, the volume and complexity of radiology procedures have significantly increased. However, the radiology workforce is not keeping pace in Nepal. Particularly the radiographers are working under the pressure of high patients load to do more for less because of acute shortage [1,8]. Around 400 radiographers are available in the country. This number is not sufficient to cover all centers. Most of the rural hospitals and private X-ray clinics are still lacking properly qualified radiographers. Most of the hospitals of Nepal are equipped with old generation or conventional types of equipments. Some of them are about 10-20 years old. The conventional X-ray is still the prime diagnostic tool in most of the rural hospitals and health care centers [1,3,8]. However, several up-to-date diagnostic and radiotherapy facilities are also available in the country [1,2,6,7]. Approximately 1200 X-ray units (60mA-1000mA) and 30 CT scanners are available in Nepal. There are only five MD-CT (16 and 64 slices) and few high frequency X-ray units located in major cities [1].

Around 51.4% of the total population of Nepal is illiterate [9]. Majority of the population of Nepal does understand neither the benefits nor the hazards of radiation energy. Because, no formal awareness programs have been conducted to aware the public about it. Therefore, they often do not complain about the received service quality. The environment around most of the X-ray clinics and diagnostic centers are often underestimated. The people around are also not aware of radiation hazard. The alert sign and symbol of radiation hazard is not available in most of the X-ray clinics and diagnostic centers. Clearly understandable information about radiology examinations, effects of radiation and safety measures neither are available in waiting areas of most diagnostic places nor are the patients well explained by physicians or radiology professionals. Radiologists often neither give much interest nor complain about the weakness of service regarding the quality and radiation protection because they are busy in other diagnostic works and more concerned with the diagnosis by reporting the obtained radiographic images. Only those who are well aware of it are practicing on a personal level [1,2]. Users need guidance on the appropriate use of procedures, radiation protection, and ethical issues [10]. Procedure justification, optimization of image quality and radiation protection, and error prevention are the important quality measures to tackle the challenges of imaging issues [11]. In Nepal, most of the medical practitioners do not have much concern about the radiation dose and protection. Evidence based radiology practice is lacking in most places. In many conditions, modern imaging is not required. However, plain x-ray or and ultrasound can answer many of the clinical questions, the practitioners often order unnecessary and unjustifying expensive imaging examinations without providing

clinical details. This kind of practice is becoming popular, as many of them receive some commission amount for referring patients. Patients have to pay high charge receiving unnecessary high dose of radiation exposures for usual results.

According to a fact-finding project report (unpublished) of Nepal, 2006-2008 most of the X-ray clinics of Nepal are running without minimum requirements of radiation protection and quality assurance. Provisions of radiation protection for staffs, patients, and public around are very poor. X-ray rooms are small and not adequately protected from radiation. In many places, collimators of X-ray machines broken or not properly used. This leads to a high dose of radiation to patients degrading the quality of radiographic image. The infrastructure even for occupational monitoring of radiation exposure does not exist in Nepal. Most of radiology professionals (except in few major hospitals and cancer centers) are practicing without a personal dosimeter. Neither the government nor the private institutions ensure the easy and essential availability of personal dosimeter to all radiology professionals and monitor it throughout the country.

Regarding the quality assurance and radiation safety, not much study work been done in Nepal. Scientific research works exploring the nationwide status of radiological services including quality and radiation protection has not yet reported. Because, the radiology professionals are too busy in their daily works and hardly get sufficient time for research works. Nor have the institutions proper facilities and sufficient budget to support research [1].

Problems and emerging challenges of quality assurance and safety

Delivery of safe, effective and quality radiology service requires adequate and qualified professionals beside the advance technology. There is an enormous shortage of adequate and qualified workforce in radiology, particularly worse in low-income and middle-income countries, where the demand exceeds supply [12]. Nepal is also facing similar problem [1,8]. The most interesting fact is that more than 100 unqualified persons without proper radiography education are working for radiographers in X-ray rooms of many private and government hospitals due to lack of qualified radiographers. In fact, the unqualified persons who are also called 'trained radiographers' primarily started working as a dark room assistant and later gained a basic knowledge to perform plain X-rays under the supervision of senior radiographers [1]. Use of appropriate radiation dose and radiation safety measures considered as one of the key quality elements in a quality radiology service preserving the health of a patient from its harmful effects without compromising its beneficial [11]. However, these unqualified radiographers do not consider the radiation protection seriously as an essential part of the work. They have neither a proper knowledge of radiological procedures nor the knowledge of radiation hazard and safety to minimize avoidable risks and harms from radiation. They do not utilize the radiation energy cautiously using radiation protection measures and appropriate radiation dose. Often, they do not use proper shielding for patients. Pregnant women often ignored by them. In busy X-ray clinics, often it has seen that several patients are waiting outside the X-ray room and some patients are getting

ready inside the X-ray room while some one is taking an X-ray of a patient in the same room with open door. In many busy centers, particularly when there is a shortage of workforce and increased workload, there is always a high chance of compromising the quality assurance and radiation safety due to human error. These unqualified radiographers unknowingly use high dose of radiation energy and put the patients, public around and themselves under a high risk of radiation hazard. Often, they have to operate sophisticated equipments without a sufficient technical operational training, which results in degrading the image quality and other possible technical errors. The private hospitals are generally profit-oriented who mostly discourage to use qualified radiographers, as they have to pay a high salary. Nevertheless, all have sophisticated radiology facilities. Therefore, usually they want to hire someone whom they can pay less and thus unqualified radiographers easily get the job opportunity [1,2]. Due to lack of workforce, clear radiation policy and strict law, this type of mal practice is promoting. It is neither unknown to the government nor is the situation easy to manage due to inefficient management policy of the government.

Due to shortage of qualified radiographers, many institutes began a three years PCL (proficiency certificate level) program in radiography under the Council for Technical Education and Vocational Training (CTEVT) to produce radiographers in the country. Although the training program offers basic lectures on radiation physics, the radiation safety part is least emphasized seriously during the study period or practical. Nevertheless, the graduates of these institutes are fully capable with sufficient skill, competency, and knowledge. The government and private sectors are not serious to increase the necessary posts for qualified radiology professionals, especially for radiographers and radiography technologists in district, zonal and major hospitals, as well as radiotherapy technologists in cancer hospitals. This shortage badly affects the regular service. Unfortunately, the government does not have definite long-term and short-term plans to fulfill the demands of qualified men power in radiology [1]. Provisions of updating opportunities with regular short and long-term training programs, refreshing courses, and related scientific meetings not offered to radiology professionals on need-based priority for professional development to improve the service quality.

X-ray is the major source of radiation exposure in Nepal. Several X-ray and CT scanner units are of low quality, which are not fully safe to use due to possibilities of radiation leakage. The cheap and low quality equipments are widely in use. In government sector, equipments are purchased by tender process. Often, they are selected by the lowest cost not by the highest quality, which are not always good enough and guaranteed for radiation safety. There is no control over the import of radiological equipments nor is the government policy to check the quality and status of radiation safety of imported equipments. However, in 1992, the Department of Health Services under the Ministry of Health and Population had made the guidelines for installation of X-ray units, which was mainly for private sector. The enforcement not strictly followed to monitor or update the guideline neither in the private nor in the government sectors [1].

Poor maintenance facility for major medical equipments,

especially radiological equipments is also a major problem in Nepal. Currently, there is an acute shortage of Bio-medical technologists and engineers. Neither the government nor the private sectors have a workshop with qualified and sufficient technical men power and proper facilities to offer prompt maintenance service throughout the country. Inadequately qualified technicians have to repair the equipments. Therefore, the radiological equipments are mostly unguaranteed for radiation safety after repair directly affecting the quality of service and safety.

The Government of Nepal has not yet given a serious focus on radiation activities and safety measures. Nor a national radiation protection commission responsible for permission and control of radiation activities, and monitor radiation safety measures has formulated in the country. However, the government has nominated a national liaison officer (NLO) to IAEA under the Ministry of Science & Technology. The NLO being an administrative officer is unrelated to radiation field by profession. The Ministry of Health and Population of Nepal has not allocated even a focal officer in the government mechanism related to radiation field that can oversee and coordinate the problems of radiation activities, monitor safety systems and proper management of radioactive waste disposals in the country and assist the government in planning and management. However, most of the radiation activities conducted in health sector. As of today, there is no legislation and regulation to oversee nuclear activities, including licensing and monitoring [3,13].

Till to date, the national occupational safety policy for radiation professionals does not exist in Nepal [3]. The National Occupational Safety and Health (OSH) policy framework of the government and Occupational Health and safety (OHS) law of Nepal does not define clearly about the radiation work, protection and compensation-incentive for radiation workers [14,15]. The existing occupational safety laws and rules are also unclear and nor does the government seriously follow them.

Steps and solutions for problems

Although, there is significant advancement in modern diagnostic and radiotherapy facilities in Nepal, the quality assurance and radiation protection part is still lacking in most of the centers [1,2]. However, some appreciable steps have begun towards the improvement of quality assurance and radiation safety. International Commission of Radiological Protection (ICRP) has issued strict guidelines on radiation protection. Regulatory boards of member countries follow those guidelines and recommendations. Two national level workshops were conducted to make Nepal a member of International Atomic Energy Agency (IAEA) and to formulate legislation to bring the use of ionizing radiation under legal framework. Nepal has become a member of IAEA in August 2008 [3,16]. The IAEA has urged the Government of Nepal to enact nuclear law and establish an Atomic Energy Commission as soon as possible to deal with nuclear issues in Nepal. The IAEA has recommended in its preliminary report submitted to the Ministry of Science and Technology (the responsible agency for official contact with IAEA) to enforce the law and regulations as soon as possible in the country. IAEA can help in many areas if it enacts nuclear laws. Nepal has yet to prepare itself for the obligations as a

member state. Nepal has not yet joined the Regional Co-operative Agreement (RCA) for research, development, and training related to nuclear science and technology for Asia and Pacific. The RCA works under IAEA and provides a framework for Asian member states to intensify their collaboration through programs and projects focused on the specific shared needs.

It is an urgent need to establish a radiation regulatory commission and formulate the radiation safety law with clear policies, rules and regulations, code of ethics for radiological practice. There should be subsequent enforcement to follow the established rules for supervision and monitoring of quality assurance, safety program of radiation activities with proper management of radiation energy and disposal of radioactive waste. Both the government and private sectors should discourage to use unqualified persons in order to discourage mal practice by increasing adequate and qualified men power to provide a safe and quality radiology service. Evidence based radiology practice relevant to the clinical problems should be practiced with a feeling of responsibility and strong ethical commitments to make this profession one of the prestigious, renowned, and safe in Nepal. The awareness program about the possible benefits and hazards of radiation activities should be conducted for the public in general. The nationwide study of the current scenario of radiation activities and real status of radiation protection may help the policy makers in the government mechanism to take necessary need-based interventions to improve the radiation work for quality service. It is the right time to take proper steps otherwise the situation of radiation safety may lead to a serious problem. Several professional organizations of Nepal such as Nepal Radiological Society, Nepal Radiologist Association, and Nuclear Society of Nepal have been lobbying the government to make new radiation policies in order to promote radiation work with enforcement of effective laws for quality radiology service in the country. The involvement of the related organizations, NGOs and INGOs with their active participation might help the government in planning, management, and evaluation programs.

CONCLUSION

In fact, the radiology workforce of Nepal has a challenging task to provide safe and quality service with limited resources. Therefore, it is an urgent need to improve the situation meeting the emerging mountainous challenges and develop the infrastructures essential for quality assurance, safety, control and monitoring of the radiation activities in the country with the involvement of both the government and private sectors.

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REFERENCES

1. Subedi KS, Sharma P. Developing radiology of Nepal facing mountainous challenges needs to gear up. *J Am Coll Radiol*. 2013; 10: 291-295.
2. Rebekah M. Nepal offers mountainous challenges to radiology. 2012.
3. Adhikari KP. Radiation safety in Nepal Strong measures called for. *The Himalayan Times*. 2010
4. Health expenditure per capita (US dollar) in Nepal.
5. Nepal National Health Accounts. World Health Organization. Government of Nepal, Ministry of Health and Population Policy, Planning and International Cooperation Division, Health Economics and Financing Unit.
6. Subedi KS, Sharma P. Cancer treatment in Nepal: A historical background, development of treatment facilities, epidemiology, and challenges for prevention and control of cancer. *Austral-Asian Journal of Cancer*. 2012; 11: 205-212.
7. Brant WE, Budathoki TB, Pradhan R. Radiology in Nepal. *AJR Am J Roentgenol* 1996; 166: 259-62.
8. Piya MK, Acharya SC. Oncology in Nepal. *South Asian J Cancer*. 2012; 1: 5-8.
9. Nepal Demographics Profile-2013.
10. Malone JF. New ethical issues for radiation protection in diagnostic radiology. *Radiat Prot Dosimetry* 2008; 129: 6-12.
11. Lau LS, Pérez MR, Applegate KE, Rehani MM, Ringertz HG, George R. Global quality imaging: emerging issues. *J Am Coll Radiol*. 2011; 8: 508-12.
12. Jersild S. Radiologist sightings drop around the world.
13. Chapagain K. Enact nuclear law: IAEA, MY REPUBLICA.com - News in Nepal. 2009.
14. Vaidya SN. Occupational safety and health situation in Nepal.
15. Nepal. Labour Act, Chapter 5. Health and safety. 2012.
16. ICRP. 1990 Recommendations of the International Commission on Radiological Protection. ICRP Publication 60. 1991; Ann ICRP 21.1-3.

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