Ionizing Radiation Sources Used in Medical Applications in Brazil

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Abstract

Data about ionizing radiation sources used in medical applications in Brazil and obtained through a IRD/CNEN national proragamme together with Brazilian health authorities are presented. This study used the geographic country division into five regions. The results are analized for each region. Due to many demographic, social and economic differences among these regions, some modifications are proposed to the UNSCEAR collection data model, for developing countries with similar situations.

Introduction

This inventory began with an IRD programme in Rio de Janeiro state (Southeast Region) where radiation protection and quality control inspections were performed in 2,000 diagnostic and 4,000 odontological X-ray equipments. The programme was extended in 1987 to other states (table 1). In one of them - Espirito Santo state (also Southeast Region) - the inventory is already completed: in the last years neither the number of diagnostic radiology equipment increased nor was the broken equipment replaced. In other states where the inventory is presently continuously updated - Acre and Rondonia (North Region) Paraiba and Ceara (Northeast Region), Sao Paulo (Southeast Region), Parana (South Region) and Goias (West Region) - the X-ray equipment is increasing with population increment. In the remaining states available data is shown but should be analysed separately since the collecting methodology was quite different (table 2).

Main results

In an UNSCEAR classification (health care level I - IV) Brazil in total can be classified to be in health care level I/II (table 3) with significant variations between the geographical regions. Using the correlation of X-ray equipment per inhabitants the classification is II/III and indicators like odontical consultations or radiodiagnostic examinations show decreasing tendency with time (fig. 1). Thus the health care level in Brazil is comparable i.e. with India or China.

Regarding the radiological examinations distribution among the main types, it was observed that the frequency for preventive procedures is lower than for the corrective procedures (fig. 3). Furthermore, in developing countries like Brazil, the population distribution in cities and countrysides (table 1) must be considered separately, because the health resources in countrysides are much smaller.

Optimizing procedures in health care thus must utilize many indicators in order to identify the actual situation and to initiate necessary actions.

Conclusions

To describe the situation and estimate deficiency resp. the needs of a country as well as to assess population exposures, the relationship among more health indicators and socio-economic variables should be considered. The results obtained have also demonstrated that a data collection standardization is necessary and unique statistical methodology analysis should be elaborated and implemented.

Nuclear Medicine and Radiotherapy data in Brazil should be more detailed. According to UNSCEAR Report 1988 nuclear medicine and the therapeutic uses of radiation is increasing in developing countries and the need for quality control will arise.

References

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Table 1 - Population Distribution

Regions	Inhabitants (x 1,000)	in Brazil (%)	Urban (%)	Country (%)
North	7,894	3	-	-
Northeast	39,764	29	56	44
Southeast	60,400	45	85	15
South	21,100	16	66	34
West	9,329	7	72	28
Brazil	138,487	100	73	23

Table 2 - National Inventory

Regions	Diagnostic X-ray Facilities	Diagnostic X-ray Equipment	Dental X-ray Equipm.	Radiother. Facilit.	Nuclear Med. Facil.
North	255	468	512	2	3
Northeast	1,123	2,011	1,466	23	19
Southeast	2,701	8,674	20,355	74	91
South	1,072	1,852	891	16	23
West	368	907	1,642	6	11
Brazil	5,519	13,912	24,866	121	147

Table 3 - Health Care Level

Classification	Inhabitants/ Physicians	Regions	States
	< 500	West	Brasilia (DF)
I	500 - 999	North	Roraima, Amapa
		Northeast	Rio G.Norte, Paraiba, Alagoas
		Northeast	Pernambuco, Ceara, Bergipa
		West	Mato Grosso, Mato G. do Sul
		Southeast	Espirito Santo, Minas Gerais
		Southeast	Rio de Janeiro, Sao Paulo
		South	Santa Catarina, Rio G. Sul
II	1000-1.999	North	Rondonia, Amazonas, Para
		Northwest	Piuaf, Bahia
		South	Parana
		West	Goias
	2000-2.999	North	Acre
		Northwest	Maranhao

Sources: IRD/CNEN, 1989; IBGE, 1987

X-RAY EXAMS FREQUENCY

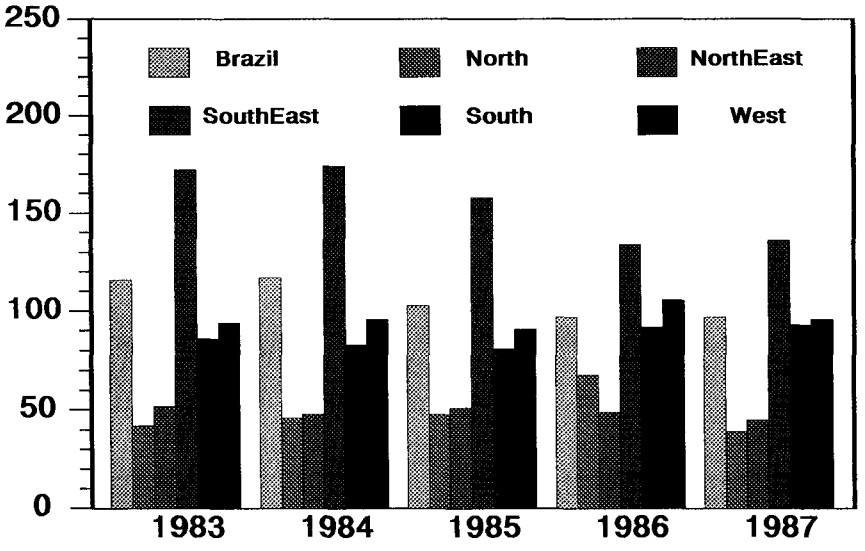

Fig. 1

DIAGNOSTIC X-RAYS

MAIN EXAMINATION DISTRIBUTION

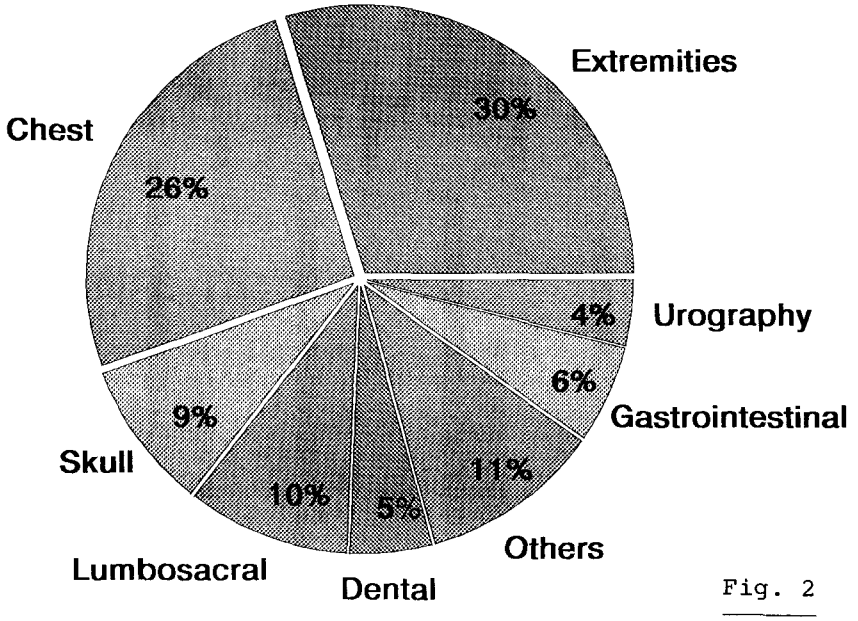

Fig. 2