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SURVEY THE PERCEPTION OF RADIATION EFFECTS AMONG MEDICAL PRACTITIONERS IN SOUTH INDIA

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ABSTRACT

The present study aimed to survey the perception of radiation effects among medical practitioners in South India. A questionnaire comprising 41 multiple choice questions was given to medical practitioners belonging to different specializations in three different states of India (Karnataka, Tamil Nadu and Kerala). A response rate of 79% was obtained (300 out of 378). The mean score was 106 out of 164. It was found that only16.7% (50 out of 300) of the medical practitioners had high awareness about radiation, its associated risks and other aspects whereas 75.3 % (226 out of 300) had moderate awareness and 8 % (24 out of 300) had poor awareness. Based on specializations cardiologists, neurologists and oncologists scored better than the others. When it came to awareness based on years of experience practitioners with 1-6 years of experience were found to be more aware than their senior counterparts. It was also undermined that junior residents, assistant professors and registrars had poor awareness among other categories when awareness was associated with the designation. In all, the state of Kerala was found to have more aware practitioners than Karnataka and Tamilnadu (with 78% moderate awareness and 22% high awareness).The overall perception of radiation and its effect happens to be moderate based on the results. Therefore, it was suggested that it is best if the medical practitioners are highly aware about radiation, dose, its risks, protection and justification, considering its hazard as a carcinogenic entity.

KEY WORDS*: perception,radiation effects,awareness,South-India,*

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INTRODUCTION

SURVEY THE PERCEPTIONOFRADIATIONEFFECTS AMONG MEDICAL PRACTITIONERS IN SOUTH INDIA

Henri Becquerel, the French scientist, in 1896 discovered the phenomenon of radioactivity, though Marie Curie, the Polish-born chemist, was the first to coin the word "radioactivity". Both Becquerel's and Curie's work was greatly assisted by an earlier scientific breakthrough when in 1895 Wilhelm Roentgen, a German physicist, discovered X- rays.Both radioactivity and the ionizing radiation associated with it have existed on earth long before life emerged. Indeed, they were present in space before the earth itself appeared. Radioactive materials became part of the earth at its very formation. There is radioactivity in the air we breathe, the food we eat and the house we live in. Even man himself is slightly radioactive since all living tissues contain traces of radioactive substances. The interaction between humans and the environment has resulted in variations in the quality and quantity of the background ionizing radiations to which a human being is exposed. Some are more exposed than others because of the type of their dwelling, location of habitation, their life styles and the level of medical care they receive. It is virtually impossible for people to avoid radiation from their living environment. Therefore, it is necessary to keep a constant vigil on the changes caused in the various sources of ionizing radiation exposuresHistorically, justification has never been seen as a nuisance, therefore minimal effort was devoted to it[1]. As per the report of international atomic energy agency's consultation on justification, nearly 50% of Radiology examination prescribed by the referring medical practitioners are unjustified and inappropriate[2].It is anticipated that part of increase in the global annual dose is due to the unjustified medical examination using ionizing radiation. The epidemiological report state patient exposing to the low dose of medical exposure of 10-50mSv might be associated with the a Cancer risks attributable to low doses of ionizing radiation[3]. The caution should be considered by referring medical practitioners before send the patient to the high dose Radiology examination such as computer tomography which some time exceeding 10mSv per examination, keeping benefit and risk of the patient who are exposing to the Radiology examination[4].In order to follow the proper justification of Radiology examination , referred medical practitioners should have good knowledge about the radiation dose and its biological effect[5].The recent research shows poor knowledge of referred medical practitioners about radiation dose, exposure unit and age related radio-sensitivity involved in the Radiology examination[6]. Even though very limited, sporadic study reported worldwide about the referred medical practitioners knowledge about the radiation dose and its biological hazard, in Indian scenario. No study has been reported.In the report held by IAEA in Vienna in December 2007, stated the core concept of justification. It basically dealt with the significant of radiation awareness to the patients[7] and also the justification process for undergoing imaging procedure. Based on the report, more research is significant in-order to develop more efficient and transparent approaches for better justification of practice. The purpose of this foremost study was to survey the perception of radiation effects among medical practitioners in South India.

METHODOLOGY

1. Research design: Cross-Sectional study
2. Research setting: Karnataka ,Tamil Nadu and Kerala
3. Population: Clinicians prescribing radiological exams
4. Sample : 300
5. Sampling technique: Convenience sampling technique.
6. Sampling criteria

Inclusion criteria: Medical practitioners who are prescribing radiological Exams

Exclusion criteria: Who are not willing to sign informed consent for the study

Sample size calculation

- $\frac{Z_{(1-\alpha/2)}^2 \text{ X } p \text{ X } q}{d^2}$

Where z= 1.96 at 5% level of significance
p is the proportion of those unaware
q Is the proportion of those aware
d is the absolute precision
= 300

STUDY PROCEDURE

The study approval was acquired from the institutional research committee, SOAHS and Ethics committee KH. Considering the inclusion and exclusion criteria 378 samples were selected by convenience sampling technique.

• Consent is first obtained from the institutional head of the partaking clinicians
• Clinicians from both rural and urban hospitals are included in the study.
• A questionnaire (both email and self-administered) comprising 41 questions with 5 domains for each question is distributed among clinicians across 3 states (Tamil-Nadu, Karnataka and Kerala).

If the tool consists of say 41 items, the following score values would be revealing.

- 41x4= 164 most favourable response possible
- 41x2=82 a neutral attitude
- 41x0= 0 most unfavourable attitude

The scores for any individual would fall between 0 and164. If the score happens to be above 82, it shows favourable opinion to the given point of view and a score of below 83 would mean unfavourable opinion. Descriptive static analysis is used to analyse the demographic chart of the medical practitioners involved in the study.

RESULTS

Out of the 378 questionnaires that were distributed, a total of 300 were returned. Clinicians belonging to 24 different specializations responded to the questionnaires. The incomplete forms were excluded from the study. The awareness levels based on specializations, experience, designation and area were calculated and charted out in both tabular and graphical fashions. .(Table-1 to 8; Figures-1 to 4)Table 1 shows that there is high awareness on radiation and its related aspects only in the case of cardiologists (50%), neurologists (55%) and oncologists (100%). The percentage of subjects with high awareness from other specializations was found to be below 50%. Maximum number of practitioners fell into the moderate awareness category with each specialization having a percentage of 50% and above, the highest being in dermatology, general surgery, general medicine, nephrology, psychiatry and respiratory medicine (100% moderate awareness).Plastic surgeons (40%), followed by neurosurgeons (33%) and gastroenterologists (16.7%) had poor awareness in all, compared to practitioners from other specializations.Table 3 shows that there is high awareness on radiation among practitioners with 1-6 years of working experience than their senior counterparts.Practitioners with 5 years of experience topped the list of highly aware with a percentage of 30, followed by those with 3 years of experience (20.5%) and 2 years of experience (18.2%). Moderate awareness is found apparent in all practitioners irrespective of their experience, with the most experienced among all i.e. (11 year) having 100% awareness, followed by 88.9% awareness in the 6 year experience category and 80% moderate awareness in the 2 year experience category. Practitioners with 8-9 years of working experience were found to be 100% having poor awareness.Table 5 shows that the junior consultants (20.4%) are more highly aware about radiation than practitioners of other designations. They were followed by junior residents (16%) and professors (15%). Practitioners of all designations were moderately aware with associate professors and medical interns having 100% moderate awareness, followed by general physicians(84.4%) and registrars(80%). 20% of the assistant professors ,20% of the registrars and 12% of the junior residents fell into the poorly aware category.Table 7 shows that practitioners from the state of Kerala are highly aware than the rest.22% of the practitioners from Kerala fell into the highly aware category, 78% in the moderate awareness group and there were none in the poor awareness group. Practitioners from Karnataka were close on their heels with a highly aware group percentage of 18.5, 76.55% in the moderate awareness group and 5% in the poor awareness group.12.9% of the medical practitioners from Tamilnadu had poorawareness on radiation and the state came last in thesurvey.

TABLE 1
AWARENESS BASED ON SPECIALIZATIONS

SPECIALIZATION		POOR AWARENESS	MODERATE AWARENESS	HIGH AWARENESS	TOTAL
Cardiology	Count	0	11	11	22
	%within specialization	0.0%	50%	50%	100%
Dermatology	Count	0	6	0	6
	%within specialization	0.0%	100%	0.0%	100%
ENT	Count	1	20	3	24
	%within specialization	4.2%	83.3%	12.5%	100%
Gastroenterology	Count	1	5	0	6
	%within specialization	16.7%	83.3%	0.0%	100%
General medicine	Count	5	37	2	44
	%within specialization	11.4%	84.1%	4.5%	100%
General surgery	Count	0	1	0	1
	%within specialization	0%	100%	0%	100%
Gynecology	Count	0	9	1	10
	%within specialization	0%	90%	10%	100%
MBBS	Count	0	1	0	1
	%within specialization	0%	100%	0%	100%
Medicine	Count	0	3	0	3
	%within specialization	0%	100%	0%	100%
Nephrology	Count	0	4	0	4
	%within specialization	0%	100%	0%	100%
Neurology	Count	0	9	11	20
	%within specialization	0%	45%	55%	100%
Neurosurgery	Count	1	2	0	3
	%within specialization	33%	66.7%	0%	100%
Oncology	Count	0	0	1	1
	%within specialization	0%	0%	100%	100%
Orthopedic	Count	0	19	9	28
	%within specialization	0%	67.9%	32.1%	100%
Pediatric medicine	Count	0	18	8	26
	%within specialization	0%	69.2%	30.8%	100%
Plastic surgery	Count	8	12	0	20
	%within specialization	40%	60%	0%	100%
Psychiatry	Count	0	1	0	1
	%within specialization	0%	100%	0%	100%
Respiratory medicine	Count	0	16	0	16
	%within specialization	0%	100%	0%	100%
Surgery	Count	5	31	2	38
	%within specialization	13.2%	81.6%	5.3%	100%
Urology	Count	3	21	2	26
	%within specialization	11.5%	80.8%	7.7%	100%
Total	Count	24	226	50	300
	%within specialization	8%	75.3%	16.7%	100%

TABLE 2
CHI SQUARE TESTS

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	114.733[a]	38	.000	0.001

Pearson χ2test was applied for association between awareness and specialization. We observed that awareness and specialization are statistically significant at α=0.05. (p value= 0.001)

TABLE 3
AWARENESS BASED ONYEARS OF EXPERIENCE

YEARS OF EXPERIENCE		POOR AWARENESS	MODERATE AWARENESS	HIGH AWARENESS	TOTAL
1	Count	3	14	1	18
	% within years of experience	16.7%	77.8%	5.6%	100%
2	Count	1	44	10	55
	% within years of experience	1.8%	80%	18.2%	100%
3	Count	6	56	16	78
	% within years of experience	7.7%	71.8%	20.5%	100%
4	Count	9	59	9	77
	% within years of experience	11.7%	76.6%	11.7%	100%
5	Count	3	20	10	33
	% within years of experience	9.1%	60.9%	30.3%	100%
6	Count	0	32	4	36
	% within years of experience	0%	88.9%	11.1%	100%
8	Count	1	0	0	1
	% within years of experience	100%	0%	0%	100%
10	Count	1	0	0	1
	% within years of experience	100%	0%	0%	100%
11	Count	0	1	0	1
	% within years of experience	0%	100%	0%	100%
Total	Count	24	226	50	300
	% within years of experience	8%	75.3%	16.7%	100%

TABLE 4
CHI-SQUARE TESTS

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	41.635[a]	16	.000	0.001

Pearson's χ^2 test was applied for association to check the association between awareness and years of experience. We observed that awareness and years of experience are statistically significant at α=0.05 (p value=0.001)

TABLE 5
AWARENESS BASED ON DESIGNATION

DESIGNATION		POOR AWARENESS	MODERATE AWARENESS	HIGH AWARENESS	TOTAL
Assistant professor	Count	4	14	2	20
	% within designation	20%	70%	10%	100%
Associate professor	Count	0	1	0	1
	% within designation	0%	100%	0%	100%
General physician	Count	3	27	2	32
	% within designation	9.4%	84.4.%	6.2%	100%
Internship	Count	0	1	0	1
	% within designation	0%	100%	0%	100%
Junior consultant	Count	6	84	23	113
	% within designation	5.3%	74.3%	20.4%	100%
Junior resident	Count	3	18	4	25
	% within designation	12%	72%	16%	100%
Professor	Count	2	15	3	20
	% within designation	10%	75%	15%	100%
Registrar	Count	1	4	0	5
	% within designation	20%	80%	0%	100%
Senior consultant	Count	4	45	13	62
	% within designation	6.5%	72.6%	21%	100%
Senior resident	Count	1	17	3	21
	% within designation	4.8%	81%	14.3%	100%
Total	Count	24	226	50	300
	% within designation	8%	75.3%	16.7%	100%

Table 6
CHI-SQUARE TESTS

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Pearson Chi-Square	13.125[a]	18	.784	0.001

Pearson's χ^2 test was applied for association ,to check the association between awareness and designation. We observed that awareness and designation are statistically significant at α=0.05 (p value=0.001)

TABLE 7
AWARENESS BASED ON ARE

Karnataka	Count	6	91	22	119
	% within state	5%	76.5%	18.5%	100%
Kerala	Count	0	32	9	41
	% within state	0%	78%	22%	100%
Tamilnadu	Count	18	103	19	140
	% within state	12.9%	73.6%	13.6%	100%
Total	Count	24	226	50	300
	% within state	8%	75.3%	16.7%	100%

TABLE 8
CHI SQUARE TESTS

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)
Fisher's Exact Test	10.622			.027

Fisher exact test was applied to check the association between awareness and area. We observed that awareness and area are statistically significant at α=0.05 (p value=0.027)

Figure 1
Stacked bar graph showing descriptive statistics of awareness against specializations

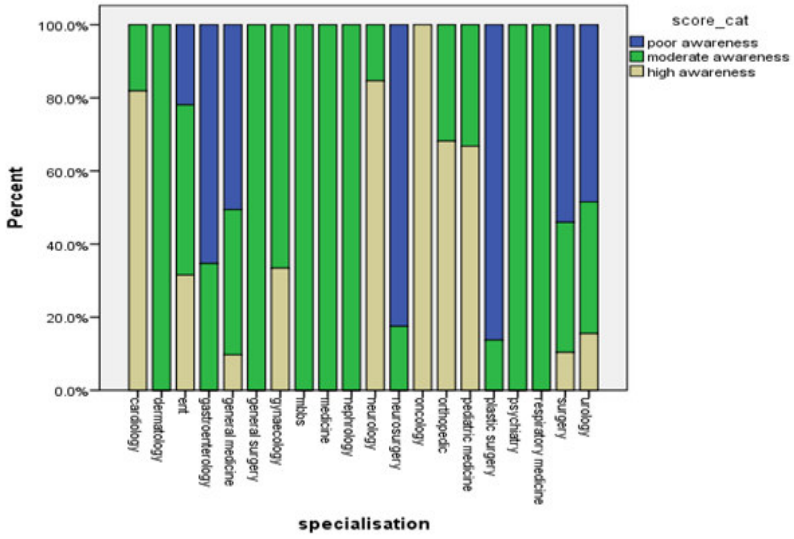


Figure 2
Stacked bar graph showing descriptive statistics of awareness against experience

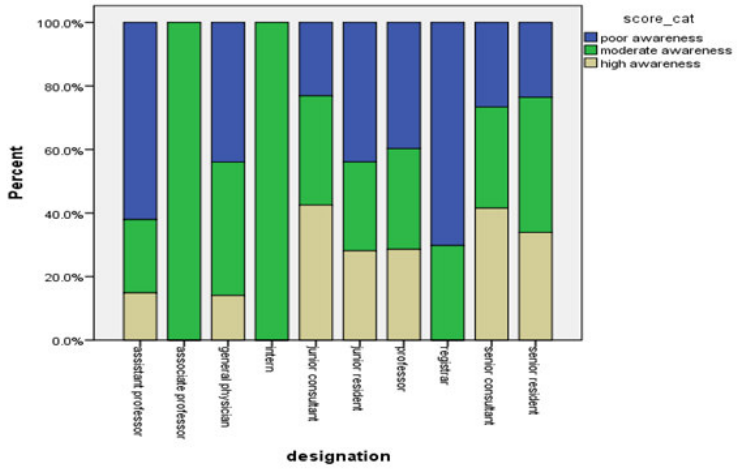


Figure3
Stacked bar graph showing descriptive statistics of awareness against designation

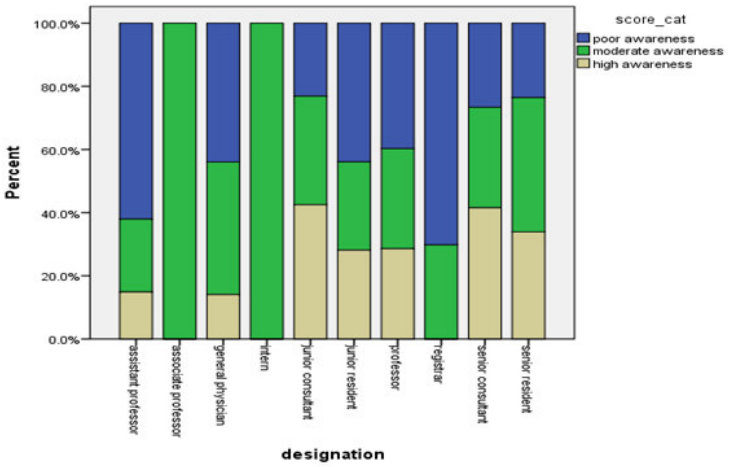
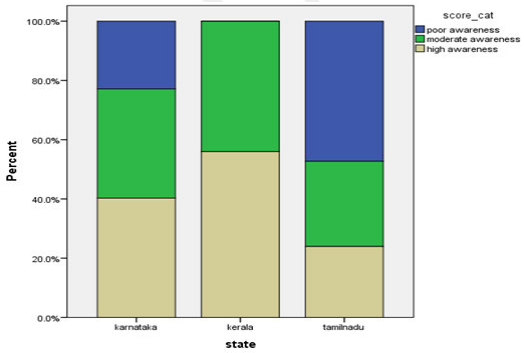


Figure4
Stacked bar graph showing descriptive statistics of awareness against state



DISCUSSION

The over-utilization of diagnostic radiography examinations has been a significant concern that has for several decades been extensively investigated and reported throughout the literature. Currently, millions of unnecessary and obsolete, or inappropriate radiography examinations are performed around the world. These examinations not only place pressure on an already tightened health care budget, but also result in inefficiencies in service delivery. One of the most serious consequences of unnecessary radiological requisition are the risks associated with ionizing medical radiation[8]. Patients are potentially at risk, of being exposed to avoidable and potentially harmful radiation. The epidemiological studies suggest that for an acute exposure 10-50 mSv and for a protracted exposure 50-100 mSv, there is reliable evidence of increased cancer risk in humans. Many single diagnostic radiography examinations produce doses in the range 1-30 mSv. These provide a reasonably firm basis to extrapolate possible cancer risks from still lower dose radiation. Many experimentally grounded and quantifiable biophysical arguments support that a linear extrapolation of cancer risk estimating appears to be the most appropriate and reasonable methodology. It is generally accepted that there is no threshold of radiation dose for cancer risk and even the smallest exposure may increase the risk of cancer. The radiation protection principle ALARA should be enforced in daily practice. Various issues have been shown to be linked to the over-utilization of diagnostic imaging examinations. The most common contributors include fear of medical litigation, the influence from the patient, financial incentives and payment structures, and lack of proper training in the correct diagnostic strategies required to manage a clinical condition. Finally, and of critical importance, is the lack of knowledge and awareness of the side effects of exposure to medical radiation [9,10,11] An important means of relieving the anxiety of patients is to educate the referring physician[12]. The radiologist usually does this on a daily basis during interactions with the referring physician by citing specific examples of risks versus benefits for any given procedure. Another means of presenting such information is through radiologists' participation in hospital conferences. Nurse education isparticularly helpful, since the nurse is often the first person encountered by the patient undergoing any specific examination[13]. The education of nurse clinicians in subspecialties such as oncology, in which the frequency of radiologic procedures is high, will often assist in diminishing the patient's anxiety. The radiologist should willingly participate on specific hospital committees that deal with radiation protection or research. The expertise of the radiologist can provide education for the members of these committees dealing with such issues. The radiologist can reach the general public with information on radiation risks through community interaction. Many local organizations are eager to have speakers for their meetings, and a radiologist spokesperson at such meetings can often counteract negative perceptions through simple question-and-answer sessions.Another important means of professional communication is through publications in scientific journals. Letters to the editor suggesting alternative methods on commenting on poor radiologic practice, especially by inadequately trained clinicians, heightens the awareness of the editors of journals to the concerns and expertise of radiologists in these matters.Radiologists can also participate in conferences addressing the issues of radiation protection. If an opportunity arises to appear on radio, on television, the radiologist should by all means assume that challenge. The ability of radio and television to reach large audiences are phenomenal. From one appearance on a syndicated television talk show, I received many letters from individuals commenting favorably on my protest against the radiation hysteria being created by a few individuals, who because of their own anxieties, or for other purposes, exaggerated the risks of diagnostic radiologic examinations.

CONCLUSION

The overall perception of radiation and its effect happens to be moderate based on the results. However, it is best if the medical practitioners are highly aware about radiation, dose, its risks, protection and justification, considering its hazard as a carcinogenic entity. More frequent courses and updates on these topics are recommended in order to keep up with the latest advancements in dose reduction and other protective measures, thereby paving the way for better patient care ultimately.

REFERENCES

1. Lee CI, Haims AH, Monico EP, Brink JA, Forman HP. Diagnostic CT scans: assessment of patient, physician, and radiologist awareness of radiation dose and possible risks. Radiology. 2004 May;231(2):393–8.
2. Report of a consultation on justification of patient exposures in medical imaging. Radiat Prot Dosimetry. 2009 Jul;135(2):137–44.
3. Brenner DJ, Doll R, Goodhead DT, Hall EJ, Land CE, Little JB. Cancer risks attributable to low doses of ionizing radiation: assessing what we really know. Proc Natl Acad Sci U S A. 2003 Nov 25;100(24):13761–6.
4. Mettler FA, Huda W, Yoshizumi TT, Mahesh M. Effective doses in radiology and diagnostic nuclear medicine: a catalog. Radiology. 2008 Jul;248(1):254–63.
5. Sukumar S. Perception of radiation awareness among medical doctors in India. International

Journal of Pharma and Bio Sciences.2013;3(3). 371-376

6. Rehani MM, Berris T. International Atomic Energy Agency study with referring physicians on patient radiation exposure and its tracking: a prospective survey using a web-based questionnaire. BMJ Open. 2012 Jan;2(5).
7. Kotian, Rahul P and Sukumar, Suresh and Kotian, Sahana R and David, Leena R. Perception of Radiation Awareness among Patients in South Indian population– A Qualitative Study. International Journal Of Scientific Research.2013. (11).373-375. 8. Haaga JR. Radiation dose management: Weighing risk versus benefit. American Journal of Roentgenology. 2001. 289–91.
8. Shiralkar S, Rennie A, Snow M, Galland RB, Lewis MH, Gower-Thomas K. Doctors' knowledge of radiation exposure: questionnaire study. BMJ. 2003 Aug 16;327(7411):371–2.
9. Söylemez H, Sancaktutar AA, Silay MS, Penbegül N, Bozkurt Y, Atar M, et al. Knowledge and attitude of European urology residents about ionizing radiation. Urology. 2013 Jan;81(1):30–5.
10. Lee RKL, Chu WCW, Graham CA, Rainer TH, Ahuja AT. Knowledge of radiation exposure in common radiological investigations: a comparison between radiologists and non-radiologists. Emerg Med J. 2012 Apr;29(4):306–8.
11. Sukumar S. Patient perception on physician practice while prescribing for radiology examination. Int J Pharma Bio Sci. International Journal of Pharma and Bio Sciences; 2015;6(2):B727–33.
12. Yurt A, Cavuşoğlu B, Günay T. Evaluation of awareness on radiation protection and knowledge about radiological examinations in healthcare professionals who use ionized radiation at work. Mol Imaging Radionucl Ther. 2014 Jun;23(2):48–53.