Awareness of Non-Radiological Background Saudi Physicians Regarding Risk of CT-Scan’s Radiation on Children

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Abstract

Background: Children are radiosensitive compared to the adult patient. Despite this, the level of concern about and well-informed interest concerning exposure to ionizing radiation on children is not known among physicians.

Aim of Study: To assess knowledge and practice among referring physicians on risks associated with radiation exposure during pediatric computed tomography imaging was assessed.

Methods: The study questionnaire was distributed to 105 Saudi physicians who were randomly selected from Aseer Central Hospital, Aseer Region, Kingdom of Saudi Arabia. Radiologists were excluded.

Results: Less than half of physicians (48.6%) were aware that their hospital’s policy indicates to openly discuss with the pediatric patient’s parents about the possible risk on children due to exposure to CT radiation, 34.3% were familiar with the principle of the “as low as reasonably achievable” and 11.4% discuss radiation doses with parents of sick children. Physicians’ awareness regarding differential risk of exposure to radiation according to child’s body parts differed significantly according to their specialty (p<0.01). Most physicians depend on self-directed learning to build up their education and training related to CT scans.

Conclusions: Physicians’ awareness about hazards of radiation exposure from CT scans among children are both inadequate and insufficient, which would mandate necessary immediate proper training measures.

Key Words: Physician’s awareness – CT radiation dose – Children – Cancer.

Introduction

EXPOSURE to more than required radiation from computed tomography (CT) has debilitating effects on the exposed person [1-4]. Compared to adults, children are more vulnerable to its effects [5,6]. Hence a substantial emphasis is made to implement strategies to decrease CT radiation doses while retaining optimum image quality [7].

Professional training on radiation dose reduction strategies aims at educating the risk-benefit ratio and the alternative use of non-radiation emitting medical modalities. The radiation risk-benefits analysis depends on the imaging competence of the physicians, the radiologist, and the technologist performing the imaging [8,9]. These skills have gained both public and professional awareness on long-term effects of medical radiation that are potentially increasing the risk of radiation-induced cancers. Raising the awareness towards such risks is facilitated by the American College of Radiology Imaging Appropriateness Criteria [10], and various initiatives [11,12], which are largely also directed at increasing physicians’ and technologists’ imaging expertise. However, referring physicians are not being educated with these ongoing updates.

The level of concern about effect of ionizing radiation from imaging procedures on children has increased between radiologists attending pediatric patients. However, awareness among physicians regarding hazards of ionizing radiation has not been improved. Indeed, studies from many developed countries [13-15] have suggested the possibility of negligence regarding prescription of radiation doses by physicians while prescribing for adult patients.

Children are more vulnerable to radiation than adult patients. Despite this, the level of cognizance among physicians who request investigations involving radiation on children remains unknown in our part of the world [15-18].

This study was, therefore, taken to survey Saudi physicians with non-radiological background, in order to find out the level of knowledge regarding radiation dose and associated dangers during pediatric radiological investigations.
Subjects and Methods

This cross-sectional study was conducted between July 2013 and August 2014 in Aseer Central Hospital, which is a tertiary care Ministry of Health hospital in Aseer Region, Saudi Arabia. The hospital policy indicates that parents should be fully informed regarding the possible harm that may develop as a result of exposure of children to diagnostic radiation.

Following a simple random sample, 105 Saudi physicians who have more than 5 years of medical practice and whose specialty may be related to diagnosis and management of sick children in addition to their referral to their patients for CT-scanning. All radiologists were excluded. A study questionnaire was constructed by the researcher based on relevant literature [19,20]. The questionnaire consisted of questions covering physicians’ speciality, experience, awareness on the ionizing radiation quantity and induced cancer risk, as well as their relation to prescriptions associated with this concern (See Annex).

Statistical analysis:

Physicians’ responses were analyzed by the Statistical Package for Social Sciences (SPSS, version 22.0). Descriptive statistics (i.e., frequency, percentage, mean and standard deviation) were applied. One-way ANOVA was applied for comparison of mean scores according to physicians’ specialty. p-values less than 0.05 were considered as statistically significant.

The King Khalid University Human Research Ethics Committee approved this study (RES#2014-01-02).

Results

A total of 105 questionnaire sheets were distributed to participant physicians. All sheets could be taken back (i.e., response rate of 100%). Table (1) shows that participants’ specialities were: Family medicine (n=52), pediatrics (n=20), neurology (n=3), general practice (n=9), and intensive / emergency care (n=21). Participants were divided according to their duration of experience in medical practice into <6 years of experience (81 physicians) and ≥6 years of experience (24 physicians).

Table (2) shows that less than half of participants (51, 48.6%) were aware that their hospital’s policy indicates to openly discuss with the pediatric patient’s parents about the possible risk on children due to exposure to CT radiation, while 62 participants (59%) agreed that there is increased risk of cancer as a result of CT scans. About one third of participants (34.3%) were familiar with the principle of the “as low as reasonably achievable” (ALARA principle). However, only 36 physicians (11.4%) discuss radiation doses with parents or guardians of sick children.

Table (3) shows that, in a Likert scale of 0 to 10, participant physicians rated the extent of harm of CT radiation overdose to different body parts of exposed children as around 5, i.e., moderate, being 5.85±2.16 for the head, 5.46±2.21 for the chest and 5.35±2.41 for the abdomen. Apart from pediatricians and neurologists, low ratings were reported by other specialties (i.e., family physicians, intensivists and general practitioners), as shown in Figs. (1-A,B,C). Differences in ratings were statistically significant according to physicians’ specialty (p<0.01 for all).

Table (4) shows that 43 physicians (41%) depend on self-directed learning to build up their education and training related to CT scans. Almost one third of physicians (32.4%) gain their knowledge and training from attending workshops, seminars or conferences related to risk of CT scans.
Table (3): Physicians’ ratings (Mean±SD) regarding harm attributed to exposure of children to an overdose of CT-radiation.

<table>
<thead>
<tr>
<th>Statements</th>
<th>Mean±SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rating the harm of the CT radiation the head of a child</td>
<td>5.85±2.16</td>
</tr>
<tr>
<td>Rating the harm of the CT radiation the chest of a child</td>
<td>5.46±2.21</td>
</tr>
<tr>
<td>Rating the harm of the CT radiation the abdomen of a child</td>
<td>5.35±2.41</td>
</tr>
</tbody>
</table>

Table (4): Sources of physicians’ knowledge/training opportunities related to CT scans.

<table>
<thead>
<tr>
<th>Educational/training opportunities</th>
<th>Frequency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-directed learning (i.e., regular reading of journals, books,etc.)</td>
<td>43 (41.0)</td>
</tr>
<tr>
<td>Workshop, seminars or conferences</td>
<td>34 (32.4)</td>
</tr>
<tr>
<td>In-house training (on job training)</td>
<td>16 (15.2)</td>
</tr>
<tr>
<td>Accredited courses conducted by professional associations</td>
<td>7 (6.7)</td>
</tr>
<tr>
<td>Postgraduate courses conducted by universities</td>
<td>2 (1.9)</td>
</tr>
</tbody>
</table>

Fig. (1-A): Physicians’ rating about the impact of CT radiation on the head of children according to their specialty.

Fig. (1-B): Physicians’ rating about the impact of CT radiation on the chest of children according to their specialty.

Discussion

Exposure of children to radiation doses during CT procedures has been intensively discussed and highlighted in literature as an increasing source of cancer risk. However, physicians who deal with sick children whose specialty is unrelated to radiology may be unaware of this risk [21].

Results of this study documented that physicians’ awareness about the effect of ionizing radiation on children was insufficient. Less than half of physicians were aware that their hospital’s policy indicates to openly discuss with parents about the possible harm that may occur due to exposing their children to diagnostic CT radiation. Moreover, only 62 physicians (59%) were aware of the risk of cancer, especially among children, as a result of exposure to an overdose of CT scans. Only about one third of participants were familiar with the important principle of “as low as reasonably achievable”, while only 11.4% of physicians used to discuss radiation doses with parents of sick children.

Several studies have explored the referring physician’s knowledge of radiation exposure from commonly performed CT scans along with their associated cancer risk. Generally, the findings indicated that the actual awareness level of radiation risks among physicians was surprisingly low and many physicians do not grasp or explain to their patients the radiation exposure involved from diagnostic imaging studies [14,22-23]. Similarly, Arslanoglu et al. [24] and Söylemez et al. [25] reported that the majority of doctors do not have any knowledge or concern regarding the actual radiation doses.

Our physicians’ awareness regarding impact of exposure of different body parts to CT radiation...
differed significantly according to their specialty. Neurologists and pediatricians showed the highest levels compared to other specialties.

This finding is in accordance with that of Fletcher et al. [26], who reported that physicians’ knowledge regarding risks of exposure to CT is highly individualized according to their specialty. Heger et al. [27] added that the awareness of pediatricians about radiation doses and risks was greater than that of physicians of other specialties. On the other hand, Keijzers and Britton [28] reported that emergency doctors had a poor knowledge of the risks from radiation exposure.

Our physicians’ had low exposure to continuing education and training related to CT scans. Results of this study revealed that 41% of physicians depend on self-directed learning to build up their own education and training related to CT scans, while only 17.1% of physicians participated in training and education programs for physicians on avoidance of CT radiation risk.

Quinn et al. [13] reported that most physicians do not know the radiation doses received by their patients during radiological procedures. They denied a significant effect of training in radiation protection on physicians’ knowledge regarding radiation hazards. Moreover, Puri et al. [23] concluded that the low awareness level of radiation risks among physicians is not correlated with their level of training.

These findings indicate that previous training educational modalities in the field of radiation hazards were almost ineffective. Therefore, on-the-job training rather than attending workshops or conferences has been recommended. Fletcher et al. [26] noted that radiologists should continuously assist clinicians in various specialties with understanding many aspects related to exposure to CT radiation, including test performance and estimates of potential risk.

Goske et al. [29] stated that a significant progress has been made in radiation protection for children during the last 10 years. Through the “Image Gently” campaign, social marketing techniques and critical partnerships with vendors, government agencies, and not-for-profit organizations, were applied to advocate best practices in radiation use and safety. Advocacies include improving education regarding radiation risk to patients from medical imaging for radiologists, technologists, and referring physicians; promoting standardization of dose measurements and display across vendor equipment; and improving medical literacy for parents.

In conclusion, physicians’ awareness about hazards of radiation exposure from CT scans among children are both inadequate and insufficient, which would mandate necessary immediate proper training measures.

References
14- LEE C.I., MAIMS A.K. and MONICO E.P.: Diagnostic CT scans: Assessment of patients, physicians and radiol-


ANNEX (Study Questionnaire)

1- Please indicate your specialty: .................................................................

2- In what year did you obtain your qualifications?

3- Does your hospital policy indicate explaining to parents the impact of CT radiation on their child?
   Yes 1
   No 2

4- Do you discuss with parents of sick children the radiation doses their child will be exposed to?
   Yes 1
   No 2

5.a- Rate the possible harm attributed to CT radiation during pediatric examination of a child’s head?
   Low 1
   High 10

5.b- Rate the possible harm attributed to CT radiation during examination of a child’s chest?
   Low 1
   High 10

5.c- Rate the possible harm attributed to CT radiation during pediatric examination of a child’s abdomen?
   Low 1
   High 10

6- Does the risk for cancer increase as a result of a CT scan?
   Yes 1
   No 2

7- Are you familiar with the “as low as reasonably achievable” (ALARA) principle?
   Yes 1
   No 2

8- What are your sources for information regarding hazards attributed to exposure to CT radiation?
   In-house training (on job training) 1
   Workshop, seminars and conference 2
   Self-directed study (i.e., regular reading of journals, books etc.) 3
   Accredited courses conducted by professional associations 4
   Postgraduate courses conducted by universities 5
   Other (Please specify) 6

الملخص العربي

هدف البحث: تقييم مستوى المعرفة وخبرة الممارسة لدى الأطباء حول المخاطر التي تصاحب التعرض لأشعة أثناء إجراء التصوير المقطعي الحوسب للأطفال.

منهجية البحث: تم توزيع استبيان على 100 طبيب سريري سعودي وفق الاختيار عليهم ظواهر مستشفى عسير المركزية منطقة عسير بالمملكة العربية السعودية.

النتائج: أُوضح أن اختلاف درجة الابتعاد بين مستشفى الجربة الإشعاعية إلى أدنى حد مقبول وصل إلى 11٪ من المستشفي وارتفاع الخدمة المقدمة، و11٪ من المستشفيات، كما كان مستوى تدريبي بحول مخاطر التعرض إلى الإشعاع محدوداً.

الاستنتاجات: مستوى درجة الابتعاد حول مخاطر التعرض للإشعاع محدوداً وحيد كاف، مما يسمح تدريبي لوضعيت ونشر استخدام الرؤى للتصوير المقطعي الحوسب للأطفال.