

Correlation of Body Mass Index (BMI) and Water Equivalent Diameter (D_w) Used for Size-Specific Dose Estimates (SSDE)

A. Abuhaimeed¹ and C. Martin²

¹The National Centre for Applied Physics, King Abdulaziz City for Science and Technology, Riyadh, Saudi Arabia.

²Department of Clinical Physics, University of Glasgow, Glasgow, UK.

INTRODUCTION

The concept of size-specific dose estimates (SSDEs) has been recommended for estimating doses delivered to patients of specific sizes from CT examinations. SSDE converts volume CT dose index ($CTDI_{vol}$) measured in phantoms of reference sizes to dose for a specific size using a conversion factor, which is determined by water equivalent diameter (D_w) for the region of interest in the patient.

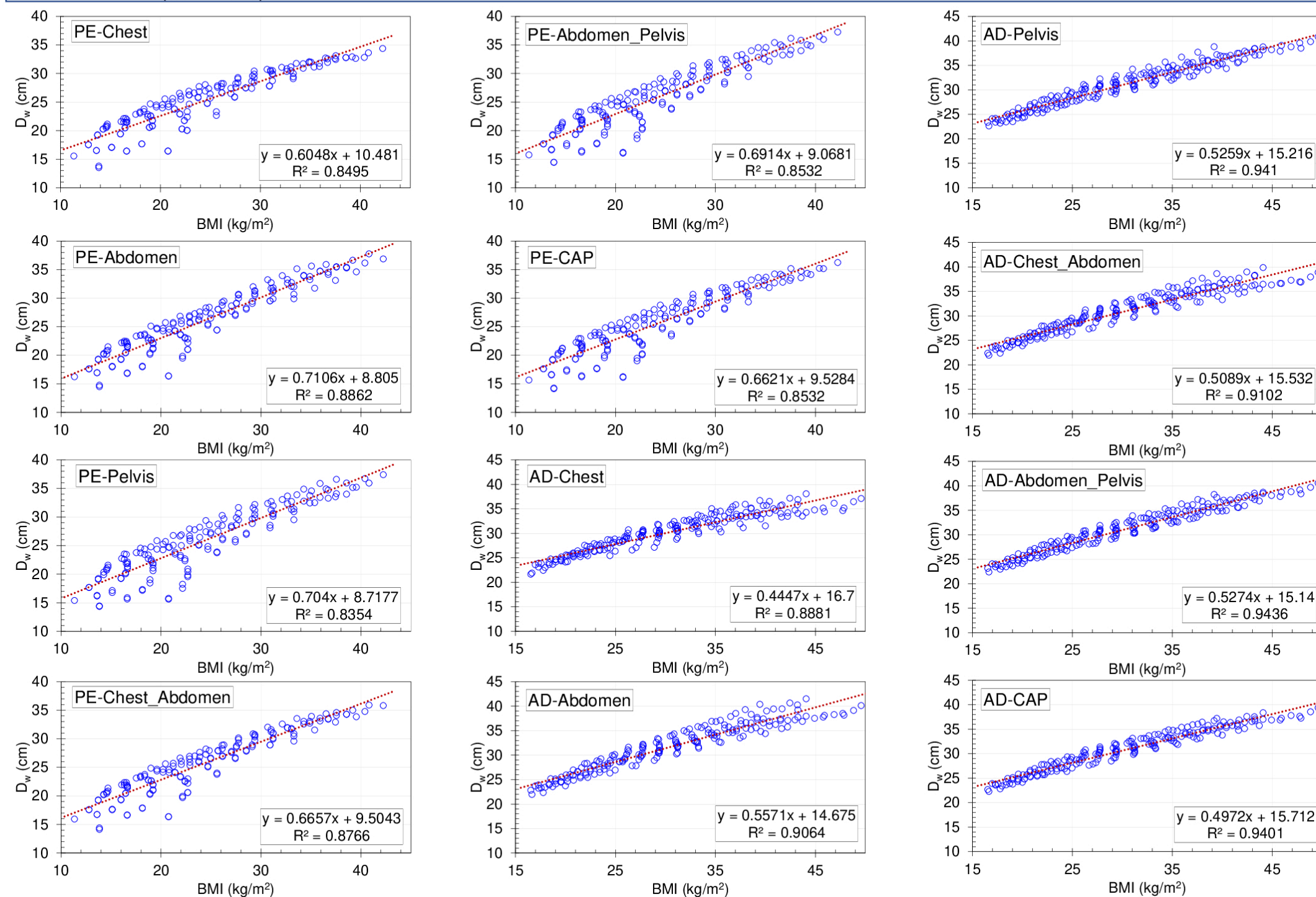
AIM

The aim of this study was to investigate the correlation between body mass index (BMI) of the patient and D_w of the region.

METHOD

A total of 158 pediatric phantoms ranging from 1 to 15 years old and 193 adults phantoms of various sizes reconstructed from images of patients who underwent CT examinations were involved [1]. The BMIs of the phantoms were in the ranges of (10 – 115) kg/m^2 and (40 – 125) kg/m^2 for pediatric and adults, respectively [2]. D_w was assessed for six scan regions for each phantom: chest, abdomen, pelvis, chest & abdomen, abdomen & pelvis, and over all the trunk regions (CAP), i.e. the trunk using a MATLAB code developed in house. D_w values were assessed with a mono-energetic beam that represented a spectrum of 120 kVp.

RESULTS: Good correlations were found between BMI and D_w for the regions studied as shown in the figures below. Values of D_w increased for each region with BMI. The correlations were analyzed by linear regression for each region. R^2 values were in the ranges of (0.84 – 0.89) for pediatric (PE) and (0.89 – 0.94) for adults (AD), and root mean square error (RMSE) of the correlations were slightly larger for pediatric (1.86 – 2.33) cm than those for adults (1.02 – 1.46) cm.



CONCLUSIONS

The correlations found between BMI and D_w may be considered as a simple and quick approach to determine D_w of a patient, and hence the conversion factor for SSDE. This approach only gives a good estimation for D_w prior to a given CT exam, but the accurate assessment should be made with the methods described in the AAPM task group report 220.

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CONTACT INFORMATION

All authors declare that there is no conflict of Interest