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Development of normative data of electro photonic imaging technique for healthy population in India: A normative study

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Abstract

Background:

Electro photonic imaging (EPI) technique is growing as a novel technique of health assessment and is being utilized in the fields of alternative medicine, conventional practices, psycho-physiology, psychology, and consciousness studies. The existing EPI norms are based mostly on European (EU) population. In order to enhance the practice and research through EPI in India, there is a need for developing norms for the healthy Indian population.

Objective:

The objective of the study was to establish the normative data of EPI for the healthy Indian population, to aid in the accuracy of EPI measurements and interpretations.

Materials and Methods:

A total of 1297 volunteers were assessed once, who represented different parts of India during December 2013 to December 2014. Among them, 880 volunteers were reported to be healthy (age mean ± standard deviation [SD], 33.55 ± 10.92), with 584 males (age mean ± SD, 33.54 ± 10.86) and 296 females (age mean ± SD, 33.56 ± 11.00). In this study activation coefficient (stress level), integral area (IA) (general health), and integral entropy (disorderliness in energy) parameters were analyzed.

Results:

As the data were not normally distributed, quartile based statistics was used for setting the norms. The $25^{th}$and 75^{th} percentiles were calculated and they were further verified using a

bootstrap procedure. Uniquely, the results showed a clear difference in IA parameters under both with filter (physiological) and without filter (psycho-physiological) conditions between the Indian and the EU population. Though other parameters were found almost similar to the EU population, inter quartile ranges were narrower in the Indian population as compared to the EU values. Similar trends were observed in the subgroup analyzes: That is, male versus female genders and age ranges 18–40 versus 40-60.

Conclusion:

As compared to EU population, Indian population had different range of Integral Area values and narrower range for values of other variables. EPI Studies in India should also adjust for factors such as age and gender.

Keywords: Activation coefficient, electro photonic imaging, gas discharge visualization, integral area, integral entropy, normative data

INTRODUCTION

Electro photonic imaging (EPI) is a novel technique growing in its application in the field of scientific instrumentation to assess health status on the basis of bio-energy. Because of its versatile applications and unique features, a number of research publications applying EPI technique can be found.[1,2,3,4,5,6,7,8,9,10,11,12,13,14,15,16] It is a quick, noninvasive, simple, painless, inexpensive method of assessment, and with a high level of reliability.[10,12] Therefore, the application of EPI is increasing worldwide and becoming more popular in various fields such as conventional practices, alternative medicine, psycho-physiologic practice, psychology, consciousness studies, sports, and material testing and it is being utilized in more than 62 countries worldwide. In the field of medicine, EPI had been employed to study diabetes mellitus, cardiovascular diseases, hypertension, autism, asthma, cancer, and many other diseases.[10,14,15,16]

Electro photonic imaging technique

Gas discharge visualization (GDV) utilizing EPI technique is based on coronal electrical discharge surrounding an object when exposed to a high electrical field.[2] The characteristics of

this electric field are high voltage of 10 kV at a frequency of 1024 Hz and low current that is in micro Amperes.[15] In particular, the fingertips are placed on a dielectric glass plate of the instrument and when such voltage characteristics are applied to the underside of the glass plate to generate a high electrical field, collision of electrons take place in the surrounding air molecules around the fingertips. These wrenched out electrons induce ionization of the air molecules and produce a glow around the finger. Further, this process is captured as a snapshot by a charged coupled device camera placed underneath the glass plate and then registered in a form of an EPI image.[5] All 10 finger images are processed through the EPI software and numerical values based on the number of pixel count are extracted corresponding to sections representing diverse organ systems in the body. In EPI, the correlation of finger sectors of the images, organs, and systems is based not only on empirical findings but also supported by the acupuncture meridian system and scientifically found circulatory system called Bonghan system.[11,17,18,19] The EPI readings are two-fold, with filter (physiological level) and without filter (psycho-physiological level).[11] A filter is a specially designed plastic sheet which is interspaced between the finger and the glass plate. The rationale of using the filter is to cut-off information generated from the cutaneous cells of finger tips due to sympathetic arousals and to register the information which is of physiological nature only.[20]

Electro photonic imaging parameters

EPI parameters are generated using various algorithms. The EPI diagram program is designed to extract these parameters. A brief description of the EPI parameters is given below.

Activation coefficient

Activation coefficient (AC) parameter is the difference between without filter and with filter readings; hence it is an evaluation of the stress level in a person. The normal stress scale range for healthy people (European [EU] population) is 2–4.

Integral area left and right

The integral area left (IAL) side and the integral area right (IAR) side parameters are a measure of general health index of a subject being measured. IA in healthy people (EU population) ranges from −0.6 to +1.[21]

Integral entropy left and right

Integral entropy left (IEL) side and integral entropy right (ILR) side parameters are components that show the degree of disorderliness in the human energy field. IE in healthy people (EU population) ranges from 1 to 2.

Need and scope of the current study

In the present scenario, all the research work and practices through EPI are utilizing the norms developed for the EU and Russian populations; however, the EPI norms for healthy Indian population are not available. From our practical observation, we anticipate that the norms for the healthy Indian people may be different from the existing EPI norms for healthy EU population. Therefore, the present study focuses on the development of EPI normative data for the healthy Indian population. This will enable and facilitate research work in India in various fields such as conventional practices, alternative medicine, and psycho-physiologic practice, psychology and consciousness studies, etc. Therefore, the current research work is undertaken to develop the EPI norms for the healthy Indian population.

Objectives of the study

The objectives were to develop EPI norms for healthy Indian population; to find out which EPI parameters differ in Indian population as compared to the EU population; to investigate, across the two populations, whether males and females have different EPI characteristics; to derive EPI norms for different age ranges and to check whether EPI characteristics differ based on diet.

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MATERIALS AND METHODS

Subjects

A total of 1297 volunteers were recruited, during December 2013 to December 2014, who represented different parts of the India. Among them, 880 volunteers were reported to be healthy, (age mean ± standard deviation [SD], 33.55 ± 10.92), with 584 males, (age mean ± SD, 33.54 ± 10.86) and 296 females (age mean ± SD, 33.56 ± 11.00). As the focus was to develop norms for healthy people, we did not include data of those with any self-reported ailments.

Inclusion criteria

The present study included only healthy Indian subjects of both genders, age range 18–60 years, and those who were willing to take part in the study.

Exclusion criteria

The exclusion criteria were: Any cut in fingers and/or absent fingers; subjects who had any self-reported health issues and if they had smoked or taken alcohol on the day of measurement.

Ethical consideration

All subjects were explained about the research protocol, measurement process and about the confidentiality of the collected data prior to their participation in the study and signed informed consent was obtained from all subjects. The study protocol was presented before the Institutional Ethics Committee of SVYASA University and an approval was obtained.

Procedure

All 10 fingertips of both the hands were used for obtaining the data from the EPI instrument. The data collection was done only once for a participant, which included two readings, that is, with filter and without filter. Guidelines established to obtain an accurate and a reliable data were followed throughout the study[22] such as the requirement of a 3 h gap between food intake and data collection, maintenance of room ambience, etc. All the volunteers were instructed to remove metallic items from the body which were not worn 24 h a day. Subjects were also guided for the finger placement for the measurements at 45° angle on the glass plate. The calibration process of the EPI instrument was carried out routinely. To clean the dielectric plate, small cotton cloth and an alcoholic solution were used. The GDV-Pro, GDV-compact and GDV-express devices were used for the measurements throughout the study. All these devices were made by Kirlionics Technologies International, Saint-Petersburg, Russia.

Data extraction and analysis

All the EPI parameters included in the study were directly extracted to the excel sheet from an inbuilt software of EPI called EPI diagram program. R statistical package was used for data analysis.[23] First of all, analysis was performed for all subjects taken together and further,

separate analyses were carried out for males and females, age groups 18–40 and 40-60 years, and also on the basis of diet pattern. As each of the variables was not found to be normally distributed, for each of the EPI parameters, 25th and 75th percentiles were taken keeping a sample size (healthy population) of n = 880, and further 25th and 75th percentiles were bootstrapped keeping sampling, k = 1000, and corresponding bootstrapped 95% confidence intervals (CIs) were also calculated.[24] Z score with cut-off value of 1.96 Z score for two-tailed condition was considered for differentiating the observed norms for the Indian population from the established norms for the EU population.

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RESULTS

Out of 1297 screened volunteers, only 880 healthy subjects were considered for analysis, who were eligible as per the inclusion and exclusion criteria. Out of 880 subjects, there were 584 males and 296 females. Table 1 presents the characteristics for all subjects.

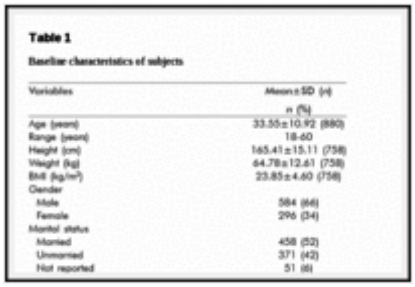

Table 1

Baseline characteristics of subjects

Variables	Mean±SD (+/-) n (%)
Age (years)	33.55±10.92 (880)
Range (years)	18-60
Height (cm)	165.41±15.11 (758)
Weight (kg)	64.78±12.61 (758)
BMI (kg/m^2)	23.85±4.60 (758)
Gender	
Male	584 (66)
Female	296 (34)
Marital status	
Married	458 (52)
Unmarried	371 (42)
Not reported	51 (6)

Table 1

Baseline characteristics of subjects

Results from Table 2

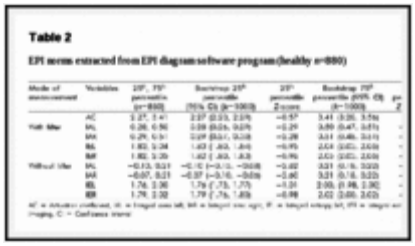

Table 2

EPI norms extracted from EPI diagram software program (healthy n=880)

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EPI norms extracted from EPI diagram software program (healthy$n$=880)

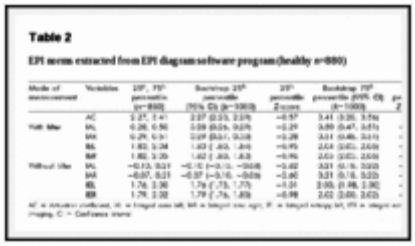

Table 2

EPI norms extracted from EPI diagram software program (healthy*n*=880)

Activation coefficient

The range of values for normal healthy people in the Indian population is 2.27–3.41. The EU range is 2–4. The 25th percentile is −0.57 SD away from the mean and the 75th percentile is +0.42 SD away from the mean. As they are <1.96 Z score (cut-off Z values for two-tailed condition), we conclude that the obtained range in the Indian population is not different from the EU values of AC.

Parameters from with filter readings

Integral area left and right

The observed IAL with filter values for a healthy Indian population range from 0.28 to 0.50 and IAR with filter values from 0.29 to 0.51, whereas these values for the EU population are −0.6 to +1 for both IAL and IAR. The observed 25th percentile for IAL is −2.29 SD away from the mean and the 75th percentile is −2.10 SD away from the mean, whereas 25th percentile for IAR is −2.28 SD and 75th percentile is −2.09 SD away from the mean. In both IAL and IAR, these values are more than 1.96 Z score, therefore the obtained values of these parameters for the Indians are different from the EU population.

Integral entropy left and right

The observed 25th and 75th percentile for IEL with filter readings for the Indian population range from 1.83 to 2.04, and for IER the range is from 1.82 to 2.05. In the EU population the range is 1–2. The 25th percentile value for IEL is −0.95 SD and the 75th percentile is −0.77 SD. The 25thpercentile value for IER is −0.96 SD and 75th percentile −0.76 SD. In both cases, they are <1.96 Z score, therefore we consider that they are not different from EU values.

Parameters from without filter readings

Integral area left and right

For IAL, the observed 25th percentile and 75th percentile values are −0.10, 0.21 and for IAR these are −0.07, 0.21 in Indian population, whereas for both IAL and IAR these values for EU population are −0.6 to +1. The 25th percentile value for IAL is −2.62 SD, and the 75th percentile is −2.35 SD. For IAR, the 25th percentile value is −2.60 SD and the 75th percentile is −2.35 SD. Both are larger than 1.96 Z score, therefore the Indian are considered different from EU values.

Integral entropy left and right

For IEL, the observed 25th percentile and 75th percentile values are 1.76–2.00 and for IER these are 1.79–2.02 in the Indian population, whereas for the EU population these are 1–2. The 25th percentile value for IEL is −1.01 SD, and the 75th percentile is −0.80 SD. For IER, the 25thpercentile value is −0.98 SD and the 75th percentile is −0.78 SD. Both are <1.96 Z score, therefore they can be considered not different from the EU values.

The analysis to check gender differences demonstrated a similar trend as per the norms for healthy Indian population in comparison to the EU population Tables Tables33 and and44.

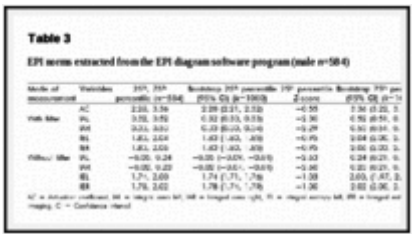

Table 3

EPI norms extracted from the EPI diagram software program (male*n*=584)

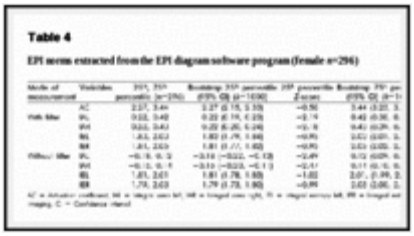

Table 4

EPI norms extracted from the EPI diagram software program (female*n*=296)

The subgroup analysis to check whether EPI norms are different in two sets of age groups 18–40 and 40-60 years showed a similar trend as per the norms for healthy Indian population in comparison to the EU population Tables Tables55 and and66.

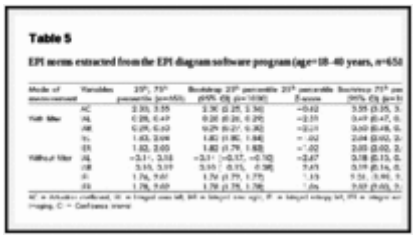

Table 5

EPI norms extracted from the EPI diagram software program (age=18-40 years, *n*=651)

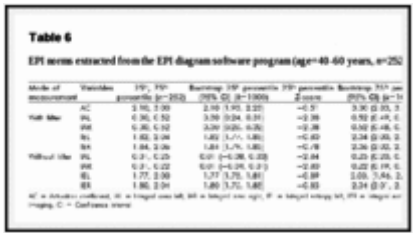

Table 6

EPI norms extracted from the EPI diagram software program (age=40-60 years, *n*=252)

The subgroup analysis of vegetarian and nonvegetarian subjects also showed the same trend as the results of overall healthy Indian norms against EU norms Tables Tables77 and and88.

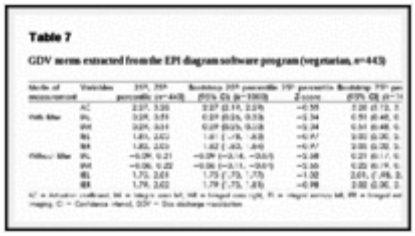

Table 7

GDV norms extracted from the EPI diagram software program (vegetarian, *n*=443)

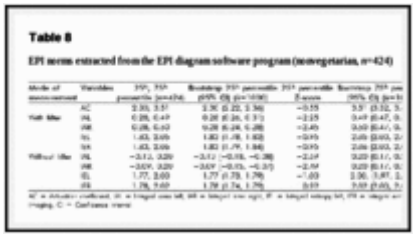

Table 8

EPI norms extracted from the EPI diagram software program (nonvegetarian, *n*=424)

In the EU norms, the condition of two SD from the mean value was taken for the norms as the data were normally distributed.[21] However, in the present study, all variables were not normally distributed [Figures [Figures11--5],5], therefore the 25th and 75th percentile values were considered for the normal range, as these values are quartile based and not affected by skewness. However, we used 1.96 as cut-off Z score assuming a normal sampling distribution for these variables. These percentile values were further estimated for interval estimates using a bootstrap procedure and a very narrow bootstrapped 95% CIs were obtained. In the Figures Figures11--55 most of the data spread is closer to the observed percentile range. From these results of existing data and from our practical observation in Indian population, we propose the following ranges for the EPI parameters of the EPI diagram program:

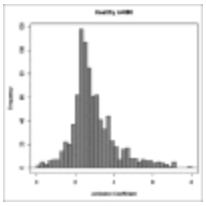

Figure 1

Activation coefficient

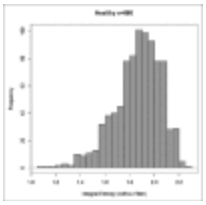

Figure 5

Integral entropy (without filter)

- AC (2.0–3.5)
- IA with filter (0.2–0.6)
- IE with filter (1.7–2.1)
- IA without filter (−0.3–+0.4)
- IE without filter (1.6–2.1).

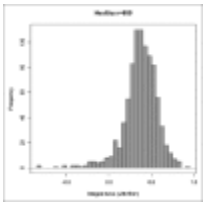

Figure 2

Integral area (with filter)

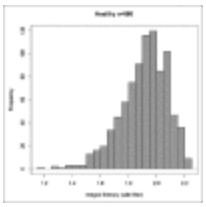

Figure 3

Integral entropy (with filter)

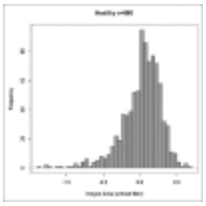

Figure 4

Integral area (without filter)

DISCUSSION

The aim of the study was to develop EPI norms for healthy Indian population and to investigate whether EPI norms differ from EU population based on gender, age and diet factors. The present findings show that IAL and IAR (general health parameter) at both physiological and psychophysiological levels in the Indian population are different from the EPI norms for the EU population. However, AC (stress levels) and IEL and IER (disorderliness in energy pattern) at both physiological and psycho-physiological levels were similar to the EU norms. Further, a similar trend was also observed in the subgroup analysis of gender, age, and diet. The findings showed that only IAL and IAR side are different at both physiological and psycho-physiological level, whereas AC and IEL and IER at both physiological and psycho-physiological level were almost similar to the EPI norms for the EU population.

Table 2 shows that 25th and 75th percentile values for the IAL and IAR side are more than 1.96 Z score (cut-off score for two-tailed condition) for both with filter (physiological) and without filter (psycho-physiological) conditions. This shows a clear difference from existing norms for the EU population. Therefore, both IAL and IAR should be considered different from the EU norms and should be noted carefully while interpreting the results from an Indian population. The EU norms for IAL and IAR are −0.6 to +1.[21] This given range for the EU population is same for both with filter and without filter measurements. The observed norms of the IA in Indian population for with filter and without filter readings are considerably different. These are the 25th percentile and 75th percentile for with filter readings of (IAL, 0.28–0.50) and (IAR, 0.29–0.51). The 25th percentile and 75th percentile for without filter readings are as shown (IAL, −0.10–0.21) and (IAR, −0.07–0.21). This indicates that the with filter condition (physiological) and without filter condition (psycho-physiological) of measurements and their normal ranges are also different. Therefore, the two different conditions of measurements with filter and without filter values should be used separately for comparisons in the Indian population.

The 25th and 75th percentile values for the IEL and IER sides were found <1.96 Z score at both with filter and without filter conditions. Therefore, both IEL and IER values are not different from the EU norms. However, the 25th percentile values in both conditions of the measurements for IEL and IER were found to be considerably different. These should also be given consideration while comparing IEL and IER values for both with and without filter conditions in the Indian population, as they were found to be quite narrower in comparison to the EU norms.

The observed 25th and 75th percentile values for AC showed <1.96 Z score. Therefore, it can be concluded that AC values of Indian population do not differ much from the established norms of the EU population; however the observed percentile range of AC (2.27–3.41) for the Indian population were found to be narrower in comparison to the AC range (2–4) for EU population.

Discussion from subgroup analyzes

The subgroup analyzes on the basis of gender, age and diet also showed similar trends as found in the overall analysis. However, the percentile values for IAL and IAR, for both with filter and without filter, between male and female subgroups were found considerably different from each other. These two conditions of measurements on the basis of gender should also be taken care of

while interpreting the results. In the subgroups of age range between 18–40 and 40-60, the percentile values for AC and IAL and IAR at without filter condition showed noticeable differences. Therefore, it is suggested that the age factor also should be taken into consideration while evaluating the results in research works. A similar trend was also observed in diet based subgroup analysis. The percentile values for AC and IAL and IAR from without filter were marginally different, but not considered significant.

Implications of this difference in overall assessment and diagnosis

The observed differences in IAL and IAR values in the Indian population will help to arrive at more accurate values for research and clinical practices using EPI in India. This will also help in assessing a person's health status more reliably in real-time.

Information with filter provides the present health status of a person, whereas information without filter indicates the possible upcoming health related issues well in advance.[13] Corrections in IA values are necessary as this will enable us to differentiate between the energy pattern of healthy and unhealthy persons in specific groups of people more precisely.

Strength and limitation

The present study could find out clear differences in the norms between the Indian and the EU population. This difference was most evident in the IA values. Apart from this, the study also demonstrated that EPI parameters are considerably different at various levels such as with filter and without filter, males and females, two different sets of age ranges, and not the least, the diet. The limitations of the study were self-reported healthy subjects and unequal numbers of males and females. We also suggest that for future studies, the sensitivity and specificity of these proposed norms may be checked by suitably choosing the target samples.

CONCLUSION

EPI norms for healthy Indian population are different from the EU norms, especially for the EPI parameter, IA. All the subgroup results also showed similar differences in IAL and IAR parameters from the EU norms. Further, the study also found considerable differences between the various subgroup factors such as gender, age range, and diet. This suggests that any study

being carried out on Indian population should consider all these vital factors carefully while analyzing and interpreting the results.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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