Short Communication

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Analysis of Chronological Fluctuation of Individual Health Check-up Data

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Abstract

In the case of evaluation of health check-up results, it is common to set the criteria of abnormality accoridng to the population distribution. However, the normal range of lab-data of individual person is usually narrower than that of population data. In this article, the authors have evaluated the chrnological chenges of health check-up data in order to evaluate the possibility of "personally set criteria of abnormality". The used data was those of individuals who have received health check-up all year from 1995 to 1999 consecutively in an Occupational health institute. Total number of persons included into the analysis was 97,945 (Male 65,159, Female 22786). The larger means of CV were observed for Triglyceride, GOT, GPT, gamma-GTP. The smaller means of CV were observed for BMI, SBP, DBP, Total-cholesterol, Ureic acid, Fasting Blood Sugar (FBS) and Hemoglobin (Hb). The present results indicated that one has to pay enough attention to evaluate a cross-sectional data for most of health check-up items excluding blood pressure and BMI because of its chronological variability.

Key words: health check-up, chronological variability, personally set criteria of abnormality

❖ Introduction

In the case of evaluation of health check-up results, it is common to set the criteria of abnormality accoridng to the population distribution. However, as Yoshida reported[1], the normal range of lab-data of individual person is usually narrower than that of population data. For Systolic blood pressure, Diastolic blood pressure, Total-cholesterol, Triglyceride, Fasting Blood Sugar (FBS), GOT, GPT, gamma-GTP and Ureic acid, they showed the standard deviations (SDs) of personal based chronological data were between 40 to 80% of the SD of group data[2]. Thus it is rather difficult to detect the abnormality of individidual person in its early stage.

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Furthemore, even though one is evaluated as "abnormal" in a particular year, it is not always a really abnormal values from the chronological point of view because of "return to average" phenomenon.

In order to solve this kind of problem, it is proposed to set a nomal range of value on the individual basis according to the chrnological data of each person.

In this article, the authors will evaluate the chrnological chenges of health check-up data in order to evaluate the possibility of "personally set criteria of abnormality", based on the health check-up data of one Occupational health institution in Japan.

❖ Material and Method

Material

The analyzed data was derived from the health check-up record from 1995 to 1999 of one Occupational health institute in Japan. The used data was those of individuals who have received health check-up all year from 1995 to 1999 consecutively. Total

Table 1 Means and SDs of CV* of health check-up items

	Male			Female		
	N	Mean	SD	N	Mean	SD
BMI	65,159	2.59	1.49	22,786	2.80	1.60
SBP	65,159	5.96	2.53	22,785	6.14	2.62
DBP	65,158	8.04	3.47	22,785	8.27	3.46
Total Cholesterol	46,505	7.40	3.58	16,030	7.55	3.45
Triglyceride	46,285	29.89	15.36	16,002	27.43	13.10
GOT	46,707	18.95	12.99	16,139	16.83	10.72
GPT	46,707	28.57	15.57	16,139	28.97	15.55
γ-GTP	46,457	22.35	14.22	16,092	20.08	13.48
Ureic acid	23,021	9.03	5.19	6,526	10.32	5.17
Hemoglobin	46,532	3.15	1.82	16,199	4.38	3.92
Fasting Blood sugar	24,035	8.67	7.07	6,765	8.20	6.13

*Coefficient of variance (CV) = SD ÷ mean × 100 (%)

number of persons included into the analysis was 97,945 (Male 65,159, Female 22786).

The items of analysis are BMI, Systolic blood pressure (SBP), Diastolic blood pressure (DBP), Total-cholesterol, Triglyceride, Fasting Blood Sugar (FBS), GOT, GPT, gamma-GTP, Ureic acid, and Hemoglobin (Hb).

Method

In order to investigate the chrnological variablity of each item of health check-up, we have calculated mean, SD and Coefficient of Variance (CV) for 5 years data. The relationship of mean and CV was also investigated.

Most of the previous research used only SD for the evaluation of variability. However, as SD is largely influenced by scale (larger mean value, wider SD), we used CV for evaluation of variability.

All statistical analyses were conducted by SPSS ver. 10.0J.

❖ Results

Table 1 shows the mean and SD of CV for each health check-up item. The larger means of CV were observed for Triglyceride, GOT, GPT, gamma-GTP. The smaller means of CV were observed for BMI, SBP, DBP, Total-cholesterol, FBS, Ureic acid and Hb.

So far as the relationship between mean of consecutive five years' data of each person and CV were concerned, the personal means of DBP and Hb showed a statistically significant negative correlation with CV ($p<0.01$). On the contrary, the personal means of Triglyceride, Fasting Blood Sugar, GOT, GPT, gamma-GTP showed a statistically significant positive correlation with CV ($p<0.01$). Figure 1 and Figure 2 show the results of DBP and FBS by sex. These results indicate that the individual with higher value of DBP and Hb tends to show narrower CV, and that the individual with higher value of Triglyceride, Fasting Blood Sugar, GOT, GPT, gamma-GTP tends to show wider CV.

❖ Discussion

First of all, there are several limitations in the present study. As there was no information about existence of medical treatment in our data, results might be biased; for example, if a person with abnormal lab-data has received a medication, the data may decrease larger than a person with normal data. Furthermore, it will be more reasonable to limit the analyses for persons with complete data. Bearing these limitations in mind, we would like to discuss the present findings.

As Iida and Yoshida reported, one has to distinguish two kinds of health check-up items from the viewpoint of chronological variability[1]. First group is the item with wider chronological variation such as Triglyceride, GOT, GPT and gamma-GTP, and the second is the item with narrower variation such as BMI, SDP, DBP, T-Chol, UA, Hb and FBS. It is well known that the length of fasting and content of pre-

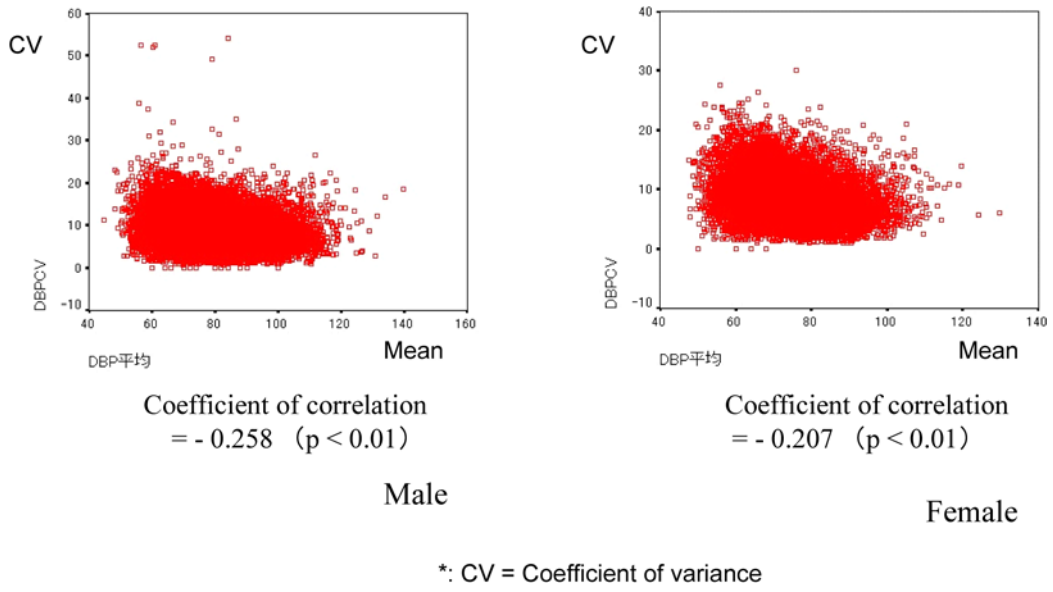

Figure 1 Relationship between chronological mean of DBP and its CV* (data from 1995 to 1999)

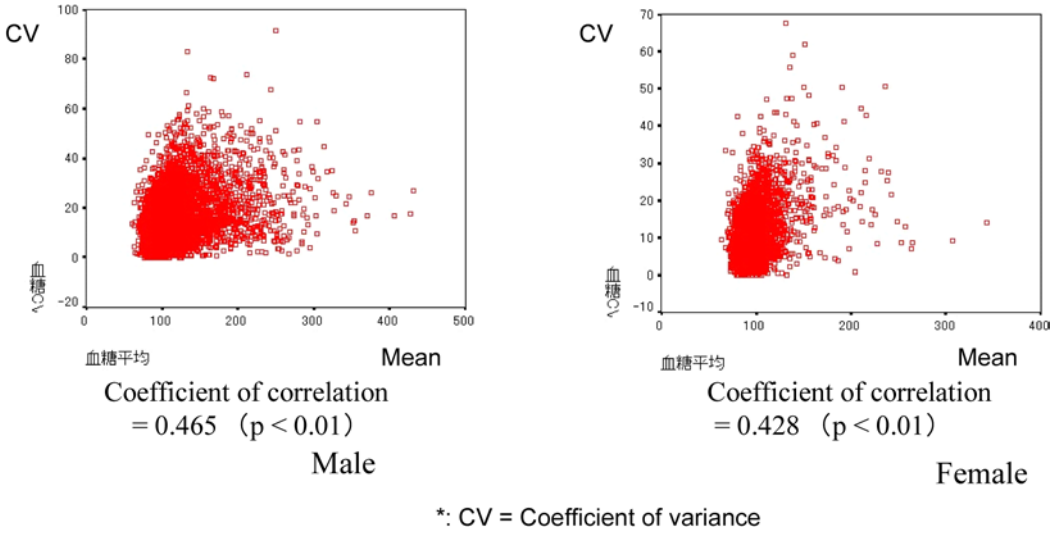

Figure 2 Relationship between chronological mean of FBS and its CV* (data from 1995 to 1999)

health check up meals will influence on the value of TG, and that the drinking habit of the date will influence on the value of GOT, GPT and gamma-GTP. For this reason, Yoshida has recommended that it is preferable to evaluate the abnormality not based on the group criteria but on the individually formulated chronological trend[1].

In order to realize a healthy aged society, the Japanese government has established a new law for the health promotion in 2006. The new law will make "the specified health checkup and intervention program" for insured over 40 years old obligatory for public health insurers from April, 2008. For the criteria to select the persons who need health education, the new law adopts the T-Chol and TG as criteria. As our results indicated, the value of TG will widely fluctuate chronologically. It is needed to investigate the effect of wide intra-personal variation of TG measurement on the validity of selection criteria.

The present results indicated that the individual with higher value of DBP has a higher possibility of abnormality in the consecutive chronological data and that one has to pay enough attention to evaluate a cross-sectional data for other items because of its

chronological variability.

Theoretically the individually set normal range is a very interesting idea. However, there are several points to be discussed before introducing such a methodology. At first, how to evaluate the items with wide chronological fluctuation, is a problem. Yamaguchi et al. have developed a new method to evaluate the personally set risk based on the probabilistic density of historical data[3]. Trend analysis method such as Box-Jenkins model (ARIMA model) will be applicable if there is a long-period data more than 10 observation points, for example.

Secondary, how to evaluate the data of person with only one year data, or scatter year data is another problem to be solved.

By the introduction of "the specified health checkup and intervention program", it will become possible to analyze a long period data of individual. It is necessary to develop appropriate methodologies for such kinds of chronological data by individual basis, if we intend to establish a life-long health support system.

❖ References

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