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Health Status of Rural and Urban Residents by Screening Test

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Introduction

Since 1960's, rapid industrialization has led this country to make a gap of socioeconomic, cultural and environmental conditions between rural and urban areas. The largely unilateral improvement of the education level, living standards and the difference of occupations employed due to the differential socioeconomic upgradings of the urban residents has given urban population a large sum of edges of the health including favorable environmental conditions, healthy behaviors and living conditions and life styles conductive to health such as better health knowledges, more amount of animal protein intake and leisure time over their rural counterparts. So we hypothesized that the differences of chaning rate in the pattern of food consumption and life standard between both areas made a different influence on health status of residents in each area.

In additions, we could also hypothesized that the sexual difference in living and food consumption pattern due to the traditional idea of male preference might also play a role. But little have been know urban and rural population as well as those between sexes. The author investigated the differences.

Samples and Methods

Study populations : 400 rural and 600 urban residents were selected by multistage cluster random sampling method. Those who had subjective symptoms and showed excessively abnormal results of laboratory tests were excluded from data analysis.

Methods : We used ELT-8 laser shadow methods for CBC, and SMA II system for 12 items of serum biochemical tests. This study was conducted from April 1987 to October 1987. The corrected means or abnormality rates were age-adjusted on the basis of the general population of Korea estimated by the National Census in 1985 (Table 1, 2).

Results

The results were arbitrarily classified into several categories : CBC, RFT(renal function test), LFT(liver function test) and others.

1. Differences of laboratory findings between rural and urban areas

1) Comparison in males

In CBC, RBC count showed a little difference between both areas while the levels of hemoglobin(Hb) and hematocrit(Ht) were higher in urban residents than in rural ones, but WBC count was higher in rural population. In RFT, both blood urea nitrogen (BUN) and creatinine were higher in urban population but the magnitude was much larger in creatinine than in BUN. In LFT, rural population showed higher levels of albumin, serum glutamic oxaloacetic tran-

Table 1. Age and sex distribution of study population

Age	Rural		Urban		Both	
	Male	Female	Male	Female	Male	Female
	No. %	No. %	No. %	No. %	No. %	No. %
20~29	16(7.8)	10(4.9)	107(38.3)	128(39.3)	123(25.4)	138(26.4)
30~39	52(25.2)	56(27.6)	72(25.8)	78(24.3)	124(25.6)	134(25.6)
40~49	58(28.2)	69(34.0)	53(19.0)	57(17.7)	111(22.9)	126(24.1)
50~59	62(30.1)	53(26.1)	29(10.4)	39(12.2)	91(18.8)	92(17.6)
60+	18(8.7)	15(7.4)	18(6.4)	19(5.9)	36(7.4)	34(6.5)
Total	206(100.0)	203(100.0)	279(100.0)	321(100.0)	485(100.0)	523(100.0)

*Number in parenthesis indicated percentage

Table 2. Reference value of haematologic and biochemical findings in Korea

Items	Unit	Normal	Range
RBC	mill/ml	M 4.6-6.2	F 4.2-5.4
Hb	g/ul	M 13.5-18.0	F 12.0-16.0
Ht	%	M 40-54	F 38-47
WBC	/ml	4500-11000	
BUN	mg%	10-20	
Creatinine	mg%	M 0.5-1.5	F 0.4-1.4
Ca	mg%	8.5-10.5	
P	mg%	2.5-4.5	
Glucose	mg%	70-100	
Cholesterol	mg%	120-200	
T. protein	g%	6.8-8.0	
Albumin	g%	3.5-5.0	
Bilirubin	mg%	0.2-1.2	
ALP	u/l	30-125	
GOT	u/l	7-40	
GPT	u/l	0-35	

saminase(SGOT) and serum glutamic pyrubic transaminase(SGPT), but the levels of total protein and bilirubin were higher in urban population. In others category, blood sugar, phosphorus and cholesterol levels were higher in rural residents while calcium was higher in urban residents(Table 3-1).

2) Comparison in females

The differences in laboratory tests between areas were nearly similar with male. In CBC, RBC count, levels of Hb and Ht were somewhat higher in urban females than those of rural females, but WBC count was remarkabley higher in urban females. RFT and LFT showed a similary pattern in both areas with those in males, except for SGOT and SGPT. Calcium level was higher in urban females but phosphorus, blood sugar and cholesterol levels were higher in rural ones(Table 3-2).

3) Sex differences

In rural areas, males showed higher levels in all items except the levels of total protein and posphorus which showed higher in females. This tendency was similar in urban population too(Table 4-1, 4-2).

2. The proportion of out of normal range in laboratory tests

In CBC of males, the proportion of below the normal range was higher in rural population. Leukopenia was frequent in urban population while leukocytosis was more frequent in rural population. In RFT of male, the proportion of lower outlier of BUN was somewhat less in urban population while upper outlier was more or less higher in urban population. Proportion of hypercreatinemia was higher in urban residents than rural residents. In liver function tests, the proportion of hypoproteinemia was higher in rural population while hyperproteinemia was higher in urban males. The proportion of hyperalbuninemia was higher than that of hypoalbuminemia in rural

Table 3-1. Compasrison of corrected mean value of haematologic and biochemical findings between healthy rural and urban resisdents(Male)

	Rural(n=174)	Urban(n=252)	P*
CBC			
RBC	4.7595± 0.349	4.8326± 0.309	−**×
Hb	14.8871± 1.237	15.6195± 1.080	−×××
Ht	44.9000± 4.416	47.1996± 3.004	−×××
WBC	7851± 1533	6423± 1787	××××
RFT			
BUN	13.5871± 3.521	14.1868± 3.620	
Creatinine	0.8502± 0.280	1.104± 0.324	−××××
LFT			
T. protein	7.4941± 0.485	7.6634± 0.486	−××
Albumin	4.4708± 0.248	4.3742± 0.245	×××
Bilirubin	0.4942± 0.176	0.5854± 0.240	−×××
ALP	84.4553± 30.132	85.9233± 24.520	
GOT	39.1917± 9.261	28.5896± 10.302	××××
GPT	32.2566± 12.493	26.3713± 16.205	××
Others			
Ca	9.3872± 0.540	9.4540± 0.555	
P	3.8613± 0.800	3.4427± 0.844	××
Glucose	90.3538± 13.210	83.8727± 13.280	×××
Cholesterol	174.3852± 36.072	172.7273± 39.452	

*P : ×<0.05 ××<0.01 ×××<0.005 ××××<0.001
**− : means Rural<Urban

population while both proportions were similar in urban area. SGOT and SGPT showed no lower outlier at all, but upper outlier were remarkably high in male population of both areas. In others category, hypo- and hypercalcemia were higher in urban than in rural residents. Hypophosphatemia was higher in urban while hyperphosphatemia was similar in both areas. Hypoglycemia was higher in urban while hyperglycemia was higher in rural residents.

Hypo- and hypercholesterolemia were higher in urban than in rural residents(Table 5-1).

In females, CBC showed that lower outlier were more frequent than those of males and upper outliers were more frequent in urban females. Urban female showed marked proportion of leukopenia and the degree of which was higher compared with that of males. In RFT, lower outlier of BUN was more frequent than that of male and upper outlier was frequently appeared in urban population. Creatinine also showed higher proportion of upper outlier in urban. In LFT, the proportion of hyperproteinemia was higher than that of hypoproteinemia, particularly in urban females. Albumin and bilirubin showed little differences between upper and lower outliers in both areas.

Serum alkaline phosphatase(ALP), SGOT and SGPT showed no lower outliers. The proportion of upper outliers of ALP and SGOT were slightly higher in rural area and so was that of SGPT in urban area. In the others catogory, hypocalcemia was much higher in rural than urban females but hyperphosphatemia was higher in rural than that of urban fe-

Table 3-2. Compasrison of corrected mean value of haematologic and biochemical findings between healthy rural and urban resisdents(Female)

	Rural(n=174)	Urban(n=252)	P*
CBC			
RBC	4.1143± 0.359	4.1784± 0.359	
Hb	12.9945± 1.154	13.3214± 1.218	−**××
Ht	39.2585± 4.417	40.7893± 4.436	−××
WBC	7116± 7316	5746± 2097	××××
RFT			
BUN	12.3164± 3.251	12.0130± 2.658	
Creatinine	0.7019± 0.181	0.9208± 0.166	−××××
LFT			
T. protein	7.6537± 0.523	7.7492± 0.467	−×
Albumin	4.4035± 0.301	4.2801± 0.328	×××
Bilirubin	0.4452± 0.242	0.5487± 0.253	−×××
ALP	72.4055± 31.820	77.5686± 30.291	−×
GOT	28.5505± 15.410	24.0141± 9.264	××
GPT	19.1523± 12.283	18.7587± 12.281	
Others			
Ca	9.2198± 0.505	9.3319± 0.550	−×
P	3.9841± 0.661	3.5116± 0.771	×××
Glucose	90.0549± 13.520	81.7787± 16.283	×××
Cholesterol	174.2328± 42.670	173.6306± 36.990	

*P : ×<0.05 ××<0.01 ×××<0.005 ××××<0.001

**− : means Rural<Urban

males. Hypoglycemia was higher in urban females while hyperglycemia was higher in rural females. Hypo- and hypercholesterolemia were more frequent in urban females than in rural females(Table 5-2).

Discussion

Differences of hematologic and biochemical tests between areas and sexes might originate from the differences in the living styles, food consumption pattern and environmental pollutions which were resulted from the different socioeconomic and cultural conditions. The differences in the results of laboratory tests between sexes may arise from the different developmental backgrounds and life styles even after marriage, especially food consumption pattern as well as the constitutional differences. However it needs more research on this subjects to clarify their influences. The function of organs in the body may be influenced by the changes in environment, life style, food consumption pattern and behavior pattern due to the elevation of living standards, particularly in the rapidly developing countries, such as Korea. Therefore, I think we have to adjust the normal laboratory range to take account of the changes.

Conclusion

In the comparisons of hematologic and biochemical findings between rural and urban populations, RBC

Table 4-1. Compasrison of corrected means laboratory findings between males and female(Rural)

		Male(n=174)	Female(n=174)	P*
CBC	RBC	4.7595± 0.349	4.1143± 0.359	×××××
	Hb	14.8871± 1.237	12.9945± 1.154	×××××
	Ht	44.9000± 4.416	39.2585± 4.417	×××××
	WBC	7851± 1533	7116± 2316	××
RFT	BUN	13.5871± 3.521	12.3164± 3.251	××
	Creatinine	0.8502± 0.280	0.7019± 0.181	×××
LFT	T. protein	7.4941± 0.485	7.6537± 0.523	−**××
	Albumin	4.4708± 0.248	4.4035± 0.301	
	Bilirubin	0.4942± 0.176	0.4452± 0.242	×
	ALP	84.4553± 30.132	72.4055± 31.820	××
	AST	39.1917± 9.261	28.5505± 15.420	×××
	ALT	32.2566± 12.493	19.1523± 12.283	××××
Others	Ca	9.3872± 0.540	9.2198± 0.505	×××
	P	3.8613± 0.800	3.9841± 0.661	−×
	Glucose	90.3538± 13.210	90.0549± 13.520	
	Cholesterol	174.3852± 36.072	174.2328± 42.670	

*P : ×<0.05 ××<0.01 ×××<0.005 ××××<0.001
**− : means male<female

Table 4-2. Compasrison of corrected means laboratory findings between males and female(Urban)

		Male(n=252)	Female(n=293)	P*
CBC	RBC	4.8361± 0.309	4.1784± 0.359	××××
	Hb	15.6195± 1.080	13.3214± 1.218	××××
	Ht	47.1996± 3.000	40.7893± 4.436	××××
	WBC	6423± 1787	5746± 2097	×××
RFT	BUN	14.1868± 3.620	12.6136± 2.658	×××
	Creatinine	1.1047± 0.324	0.9208± 0.166	××××
LFT	T. protein	7.6634± 0.486	7.7492± 0.467	−**×
	Albumin	4.3742± 0.245	4.2801± 0.328	××
	Bilirubin	0.5854± 0.240	0.5487± 0.253	
	ALP	85.9233± 24.520	77.5686± 30.291	×××
	AST	28.5896± 10.302	24.0141± 9.254	×××
	ALT	26.3713± 16.205	18.7587± 12.281	××××
Others	Ca	9.4540± 0.555	9.3319± 0.550	×
	P	3.4427± 0.844	3.5116± 0.771	
	Glucose	83.8727± 13.280	81.7787± 16.283	
	Cholesterol	172.7273± 39.452	175.1795± 36.990	

*P : ×<0.05 ××<0.01 ×××<0.005 ××××<0.001
**− : means male<female

Table 5-1. Compasrison of outlier of normal range of laboratory findings between healthy rural and urban residents(Male)

		Rural %	Urban %
CBC			
RBC	Hypo-erythrocythemia	31.7	17.0
	Hyper-erythrocythemia	0	0
Hb	Hypo-haemoglobinemia	9.1	2.7
	Hyper-haemoglobinemia	0.5	1.6
Ht	Hypo-hematocritemia	5.9	1.1
	Hyper-hematocritemia	0.5	1.2
WBC	Leukopenia	2.7	6.4
	Leukocytosis	8.6	2.7
RFT			
BUN	Low-BUN	4.8	4.2
	Hyper-BUN	3.0	3.4
Creatinine	Hypo-creatinemia	0.5	1.5
	Hyper-creatinemia	0.5	5.3
LFT			
T. protein	Hypo-proteinemia	8.6	2.3
	Hyper-proteinemia	8.1	20.3
Albumin	Hypo-albuminemia	0.6	0.4
	Hyper-albuminemia	3.2	0
Bilirubin	Hypo-bilirubinemia	1.1	0
	Hyper-bilirubinemia	0.5	1.1
ALP	Low-alkaline phosphatase	0.5	0
	Hyper-alkaline phosphatase	2.2	4.5
SGOT	Low-SGOT	0	0
	Hyper-SGOT	26.9	10.9
SGPT	Low-SGPT	0	0
	Hyper-SGPT	29.6	20.8
Others			
Ca	Hypo-calcemia	1.6	4.5
	Hyper-calcemia	0.5	1.9
P	Hypo-phosphatemia	1.1	7.5
	Hyper-phosphatemia	10.2	10.6
Glucose	Hypo-glycemia	1.1	10.9
	Hyper-glycemia	15.6	10.2
Cholesterol	Hypo-cholestermia	6.5	25.2
	Hyper-cholestermia	4.2	23.0

count, Hb and Ht showed higher values in urban residents than in rural residents but WBC count was higher in rural residents. BUN and creatinine showed higher values in urban than in rural residents. Total protein, bilirubin and ALP were higher in urban residents while albumin SGOT and SGPT were higher in rural than in urban residents. Calcium showed higher value in urban than rural resi-

Table 5-2. Compasrison of outlier of normal range of laboratory findings between healthy rural and urban residents(Female)

		Rural %	Urban %
CBC			
RBC	Hypo-erythrocythemia	44.1	51.9
	Hyper-erythrocythemia	0	0
Hb	Hypo-haemoglobinemia	10.8	10.2
	Hyper-haemoglobinemia	0	1.3
Ht	Hypo-hematocritemia	26.2	19.6
	Hyper-hematocritemia	0	3.2
WBC	Leukopenia	4.6	19.6
	Leukocytosis	4.1	0.6
RFT			
BUN	Low-BUN	14.4	16.0
	Hyper-BUN	0.5	3.5
Creatinine	Hypo-creatinemia	0.5	0
	Hyper-creatinemia	0.3	3.9
LFT			
T. protein	Hypo-proteinemia	5.7	2.2
	Hyper-proteinemia	17.4	26.0
Albumin	Hypo-albuminemia	1.6	0.6
	Hyper-albuminemia	1.5	0
Bilirubin	Hypo-bilirubinemia	1.6	0
	Hyper-bilirubinemia	1.5	0.3
ALP	Low-alkaline phosphatase	0	0
	Hyper-alkaline phosphatase	7.2	4.5
SGOT	Low-SGOT	0	0
	Hyper-SGOT	6.2	4.2
SGPT	Low-SGPT	0	0
	Hyper-SGPT	5.1	6.7
Others			
Ca	Hypo-calcemia	8.7	3.5
	Hyper-calcemia	1.5	1.3
P	Hypo-phosphatemia	2.1	6.1
	Hyper-phosphatemia	20.5	8.6
Glucose	Hypo-glycemia	5.0	12.2
	Hyper-glycemia	15.4	5.4
Cholesterol	Hypo-cholestermia	7.7	25.6
	Hyper-cholestermia	3.2	19.9

dents while phosphorus, blood sugar and cholesterol values were higher in rural area. In the differences of laboratory findings by sexes, males showed higher values in all items except total protein and phosphorus.

According to the proportion of abnormalities of laboratory findings, RBC, Hb and Ht were higher in lower outliers in rural population but leucocytosis

was more frequent in rural residents. The upper outlier of BUN and hypercreatinemia were higher in urban than rural residents. The proportion of hyperproteinemia and upper outliers of ALP were higher in urban residents while the proportion of hyperalbuminemia, upper outliers of SGOT and SGPT were higher in rural than urban population in males. The proportion of hypocalcemia was higher in rural residents while hypercalcemia was higher in urban population. The proportion of hypophosphatemia was higher in urban resident while hyperphosphatemia was higher in rural residents than urban residents. The proportion of hypoglycemia was higher in urban while hyperglycemia was higher in rural residents. The proportion of lower and upper outliers of cholesterol were higher in urban than those of rural population. In females, the tendency were almost similary in males except ALP, SGOT and calcium but the magnitude were somewhat lower in females than in males.

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□ 國 文 抄 錄 □

Screening Test에 의한 農村 및 都市住民들의 健康狀態

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農村住民 400名 都市住民 600名에 대한 血液 및 血淸學的檢査를 통하여 그 健康狀態를 調査한바 다음과 같은 성적을 얻었다.

地域別 各種檢査의 平均値는 農村男子에서 赤血球數, 血色素量, 赤血球容積値들은 都市住民이 農村住民에 比하여 높았고 白血球數는 農村住民에서 높았다.

腎機能檢査에서 血中尿素窒素値 및 creatinine値는 都市住民에서 높았고 肝機能檢査에서는 總蛋白質量, bilirubin 및 alkaline phosphatase値는 都市住民에서 albumin, SGOT 및 SGPT는 農村住民에서 높았다.

其他범주에서는 血中 calcium은 都市住民에서 燐,

血糖 및 cholesterol値는 農村住民에서 높았다.

平均値의 性別差異에서는 農村, 都市 모두 男子의 平均値가 總蛋白質値 및 燐値을 除하고는 모두 男子에서 높았다.

다음으로 各檢査値의 正常範圍에 대한 異常値率을 보면 農村男子에서 赤血球數, 血色素量 및 赤血球容積値에서 正常範圍가 下値率이 都市男子에 比하여 높았으나 白血球數値는 農村住民에서 正常範圍以上値가 높았다. 血中尿素窒素値는 正常範圍以上, 以下値間이나 都農住民間에 別差異가 없었고 creatinine은 都市住民에서 以上値率이 높았다.

肝機能檢査에서는 總蛋白, alkaline phosphatase는 都市住民에서 正常範圍以上値가 高率인데 反하여 albumine, SGOT 및 SGPT는 農村住民에서 以上値率이 높았다.

其他범주에서는 calcium은 都市住民에서 燐 및 血糖値는 農村住民에서 正常範圍以上値率이 높았고 cholesterol値는 正常範圍以下 및 以上値 모두 都市住民에서 高率이었다.

女子에서는 血液相에서는 男子에 比하여 正常範圍以下値의 頻度가 더욱 심하였으나 其他値에서는 男子에 比하여 都農間의 差異가 적은點을 除外하고는 거의 같은 傾向을 나타내었다.