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Occupational Health Assessment of Permanent University Employees in Terms of Clinical Biochemical Data

Klinik Biyokimya Verileri Açısından Bir Üniversitede Çalışan Daimi İşçilerin İş Sağlığı Değerlendirilmesi

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ABSTRACT

Aim: Occupational health and safety involves important measures, trainings, and health screenings as defined by law. The existing literature on occupational medicine practices and related clinical laboratory data has considerable room for expansion. The aim of this study is to contribute to the evaluation of workplace medicine practices with original laboratory data.

Material and Method: The clinical laboratory data of the workers from the Alanya Alaaddin Keykubat University, Turkey, were analyzed retrospectively. Biochemical test results of a total of 104 permanent worker, 43 women and 61 men, were compared. Statistical analysis results were evaluated and $p<0.05$ was accepted as the limit of significance.

Results: In the statistical analysis based on sex, AST (Aspartate Aminotransferase), ALT (Alanine aminotransferase), RBC (Red blood cell), HGB (Hemoglobin), HCT (Hematocrit), MCH (Mean Corpuscular Hemoglobin; Average Cell Hemoglobin), MCV (mean erythrocyte volume), MCHC (Average Cell Hemoglobin Concentration), MONO (Monocyte) and MONO% values are higher in male workers, whereas PLT (platelet), PCT (Percent ratio of platelet cells to other cells), RDW-CV (Erythrocyte distribution width-coefficient variation-coefficient of variation) and RDW-SD (Erythrocyte distribution width-standard deviation) values are higher in female workers ($p<0.05$).

Discussion: In this study, the young age of the participating workers prevented laboratory results to go off the reference range. Values that differ between female and male gender groups are in line with expected differences based on gender. Including the fasting blood glucose values in routine clinical laboratory tests requested within the scope of workplace medicine may be useful in the early diagnosis and prevention of increasingly frequent insulin resistance, obesity, and type 2 diabetes mellitus.

Keywords: Clinical Laboratory, Biochemistry, Workplace Medicine, Occupational Health

ÖZ

Amaç: İş sağlığı ve güvenliği yasalarla belirlenmiş önemli tedbirler, eğitimler ve sağlık taramaları içermektedir. Literatürde iş sağlığı ile ilgili yapılan işyeri hekimliği uygulamaları ve ilgili klinik laboratuvar verileri ile ilgili eksiklik bulunmaktadır. Bu çalışmada özgün laboratuvar verileri ile işyeri hekimliği uygulamalarının değerlendirilmesi amaçlandı.

Materyal-Metot: Alanya Alaaddin Keykubat Üniversitesi çalışanlarının klinik laboratuvar verileri geriye dönük olarak incelendi. 43'ü kadın 61'i erkek toplam 104 daimi işçinin biyokimyasal test sonuçları karşılaştırıldı. İstatistiksel analiz sonuçları değerlendirildi ve $p<0,05$ anlamlılık sınırı olarak kabul edildi.

Bulgular: Cinsiyete dayalı istatistiksel analizde, AST (Aspartat Aminotransferaz), ALT (Alanin aminotransferaz), RBC (Kırmızı kan hücresi), HGB (Hemoglobin), HCT (Hematokrit), MCH (Ortalama Korpuskuler Hemoglobin; Ortalama Hücre Hemoglobini), MCV (ortalama eritrosit hacmi), MCHC (Ortalama Hücre Hemoglobin Konsantrasyonu), MONO (Monosit) ve % MONO değerleri erkek çalışanlarda daha yüksekken, PLT (trombosit), PCT (Trombosit hücrelerinin diğer hücrelere yüzde oranı), RDW-CV (Eritrosit dağılımı genişlik-katsayı değişim katsayısı) ve RDW-SD (Eritrosit dağılım genişliği-standart sapma) değerleri kadın çalışanlarda daha yüksektir ($p<0,05$).

Tartışma: Bu araştırmada işçilerin genç olması belirgin şekilde referans aralıkların dışına çıkmış laboratuvar sonuçlarının oluşmasını önlemiştir. Kadın ve erkek cinsiyet grupları arasında farklılık çıkan değerler, cinsiyete göre farklı olması beklenen değerlerdir. İşyeri hekimliği kapsamında klinik laboratuvar istemleri arasına rutinde açlık kan glikoz değerlerinin de dahil edilmesi giderek sıklığı artan insülin direnci, obezite ve tip 2 diyabetes mellitus'un erken tanı ve önlenmesinde faydalı olabilir.

Anahtar Kelimeler: Klinik Laboratuvar, Biyokimya, İşyeri Hekimliği, İş Sağlığı

The study was conducted with the permission granted by the Alanya Alaaddin Keykubat University Clinical Research Ethics Committee under the resolution no. 10354421-2019/10/9, dated 26.09.2019.

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INTRODUCTION

Every year approximately 300 million occupational accidents take place, about 10 million employees are diagnosed with occupational diseases, and more than 3 million employees die for reasons related to working conditions worldwide.[1] This is a picture with grave health problems and economic loss. Several international associations and platforms as the International Labor Organization (ILO) work to ensure occupational health and safety. These efforts essentially comprise studies to identify related risks and to take effective measures in order to prevent illness and accidents. Medical practices undertaken for this purpose include standard medical examination before employment, assigning tasks compatible with the health status of the employees, vaccination and follow-up to ensure effectiveness, assessment of workplace environment factors, checking the risk factors in the workplace, providing healthcare in the workplace, health education and consultancy, regular examination and screenings. The purpose of periodic checks is both the early diagnosis of any disease in subjects with a healthy appearance and regular evaluation for specific purposes in accordance with the type of work and environmental factors in the workplace. Standard onboarding examinations and regular clinical examinations and screenings include requests of clinical laboratory tests. The evaluation of these clinical laboratory data is very important both in terms of evidence-based medicine and the documentation of the current situation.[2]

Workers in our study are classified as less dangerous because they work at the university. The nature of work in the Republic of Turkey following the initial examinations according to the current legislation, the personal characteristics of the worker, workplace hazard class and business qualities primarily made in the workplace with international standards, taking into account the risk assessment results in line; Periodic inspection is repeated at least every five years for jobs in less hazardous class.[3] For this reason, since the biochemical examinations will take a long period of five years, the parameters should be determined and evaluated very well.

Therefore, clinical laboratory data are a routine element in workplace medicine and contain valuable information. The existing literature on occupational medicine practices and related clinical laboratory data has considerable room for expansion.

The aim of this study is to contribute to the evaluation of workplace medicine practices with original laboratory data. Thus, the biochemistry data of occupational health screenings, which could not find enough place in the literature until today, will be discussed in an original way.

MATERIAL-METHODS

Ethical permission: The study was conducted with the permission granted by the Alanya Alaaddin Keykubat University Clinical Research Ethics Committee under the resolution no. 10354421-2019/10/9, dated 26.09.2019.

Scope of the study: Workplace medical records of 104 people employed by the Alanya Alaaddin Keykubat University, Turkey were comparatively evaluated according to gender. These employees comprised of 43 women and 61 men between the ages 22-49. The relevant clinical laboratory data of the employees obtained during the occupational health screenings were analyzed retrospectively.

Statistical analysis: Kolmogorov-Smirnov test was performed for Test of Normality. Kolmogorov Smirnov test is perhaps the most known and used of the hypothesis tests that test the assumption of normality. If the z value shown as a result of the analysis and the significance level (asymp. sig.) Associated with it are significant at the $p<.05$ level, the hypothesis is rejected, and the distribution is decided to be not normal. If the value of $p>.05$ is obtained, the hypothesis is accepted, and it is interpreted that the distribution does not show a significant difference from the normal distribution. It was evaluated that the laboratory parameters were distributed normally (p>0.05). Biochemical parameters were compared between groups according to gender with the parametric Independent Samples T Test. Firstly, homogeneity was evaluated with Levene's Test for Equality of Variances. Then the Independent Samples Test sig. (2-tailed) value was checked in accordance with the homogeneity condition.[4] ROC (Receiver Operating Characteristic) curves were drawn for all biochemical parameters. The areas under the Roc curve were determined. Statistical significance was accepted as p <0.05. The size of the area under the ROC curve indicates how significant the result is.

RESULT AND DISCUSSION

The mean age and standard deviation of female and male groups were respectively 34.86 ± 6.15 and 33.23 ± 5.80 (mean ± standard deviation). No significant difference was found between mean age values.

Kolmogorov-Smirnov test was performed for Test of Normality. It was evaluated that the laboratory parameters were distributed normally by Kolmogorov-Smirnov test (p>0.05). Then, statistical analysis was performed to compare the groups determined by gender. Descriptive statistics results were given in figure 1 below.

In the statistical analysis of the comparative evaluation of female (n=43) and male (n=61) employees, AST (Aspartate Aminotransferase), ALT (Alanine aminotransferase), RBC (Red blood cell, Red blood cell count), HGB (Hemoglobin), HCT (Hematocrit), MCH (Mean Corpuscular Hemoglobin; Average Cell Hemoglobin), MCV (mean erythrocyte volume), MCHC (Average Cell Hemoglobin Concentration), MONO (Monocyte) and MONO% values are higher in male workers, whereas PLT (platelet), PCT (Percent ratio of platelet cells to other cells), RDW-CV (Erythrocyte distribution width-coefficient variation-coefficient of variation) and RDW-SD (Erythrocyte distribution width-standard deviation) values are higher in female workers (p<0.05). Biochemical parameters were compared between groups according to gender with the parametric Independent Samples T Test. Firstly, homogeneity was evaluated with Levene's Test for Equality of Variances. Then the Independent Samples Test results were given in figure 2 below. The Roc curves of all biochemical and CBC parameters were drawn and given in figure 3 below. The area information under the Roc curve is given in figure 4 below.

Group Statistics

Sex		N	Mean	Std. Deviation	Std. Error Mean
Urea	Female	43	19,7674	5,96353	,90943
	Male	61	27,3934	6,53778	,83708
Creatinine	Female	43	,7209	,07348	,01121
	Male	61	,8689	,10020	,01283
AST	Female	43	16,3023	4,87235	,74303
	Male	61	19,0984	5,70294	,73019
ALT	Female	43	17,8837	9,90000	1,50974
	Male	61	24,3279	11,63575	1,48981
Hgfh	Female	43	107,9302	9,42741	1,43767
	Male	61	110,7377	9,52173	1,21913
WBC	Female	43	7,4500	1,74833	,26662
	Male	61	7,5072	1,82472	,23363
RBC	Female	43	4,6977	,53330	,08133
	Male	61	5,1946	,48475	,06207
HGB	Female	43	12,5070	1,34755	,20550
	Male	61	15,0426	1,29105	,16530
HCT	Female	43	37,3070	3,46653	,52864
	Male	61	43,5869	3,26504	,41805
PLT	Female	43	284,5581	54,09617	8,24959
	Male	61	242,5246	42,74678	5,47316
MCH	Female	43	27,3535	3,13045	,47739
	Male	61	29,1080	2,38896	,30588
MCV	Female	43	81,1163	6,62351	1,01008
	Male	61	83,6705	5,64967	,72337
MCHC	Female	43	33,3488	1,43749	,21921
	Male	61	34,6049	1,00090	,12815
PCT	Female	43	,2991	,05735	,00875
	Male	61	,2467	,03893	,00498
MPV	Female	43	10,3814	,86196	,13145
	Male	61	10,2574	,76343	,09775
PDW	Female	43	11,8744	2,01259	,30692
	Male	61	11,7328	1,72913	,22139
EOSPercent	Female	43	2,3005	1,84829	,28186
	Male	61	2,4070	1,19861	,15347
LYMP	Female	43	2,1907	,61881	,09437
	Male	61	2,4385	,65448	,08380
LYMPPercent	Female	43	31,5930	9,60368	1,46455
	Male	61	33,3967	6,12133	,78376
MONOPercent	Female	43	7,2860	1,67894	,25604
	Male	61	8,2213	1,92303	,24622
BASOPercent	Female	43	,4953	,16612	,02533
	Male	61	,5361	,20578	,02635
NEUPercent	Female	43	58,9698	9,18307	1,40041
	Male	61	55,6426	7,08537	,90719
NEU	Female	43	4,3207	1,55870	,23770
	Male	61	4,1946	1,28872	,16500
EOS	Female	43	,1665	,14149	,02158
	Male	61	,1825	,10612	,01359
BASO	Female	43	,0370	,01489	,00227
	Male	61	,0395	,01586	,00203
MONO	Female	43	,5233	,14257	,02174
	Male	61	,6079	,18926	,02423
PLCR	Female	43	27,4977	7,47684	1,14021
	Male	61	26,7016	7,03370	,90057
RDWCV	Female	43	13,6233	1,71365	,26133
	Male	61	12,6852	1,12277	,14376
RDWSD	Female	43	39,9326	3,64422	,55574
	Male	61	38,3705	2,39787	,30702
IG	Female	43	,0202	,01058	,00161
	Male	61	,0248	,01501	,00192
IGPercent	Female	43	,2698	,12447	,01898
	Male	61	,3295	,19352	,02478

Figure 1. Descriptive Statistics of Clinical Biochemistry Laboratory Data for the Workers

Figure 1 Explanation: AST (Aspartate Aminotransferase), ALT (Alanine aminotransferase) eGFR (Estimated glomerular filtration rate), WBC (White blood cell; leukocyte count), RBC (Red blood cell, Red blood cell count), HGB (Hemoglobin), HCT (Hematocrit), PLT (Platelet), MCH (Mean Corpuscular Hemoglobin; Average Cell Hemoglobin), MCV (mean erythrocyte volume), MCHC (Average Cell Hemoglobin Concentration), PCT (Percent ratio of platelet cells to other cells), MPV (Average platelet volume), PDW (Platelet Distribution Width), EOS (Eosinophil), LYM (Lymphocyte), MONO (Monocyte), BASO (Basophil), P-LCR (Large platelet cell ratio), RDW-CV (Erythrocyte distribution width-coefficient variation-coefficient of variation), RDW-SD (Erythrocyte distribution width-standard deviation), IG (Immature Granulocyte). Percent: Percentage (%). Clinical laboratory parameters were evaluated according to gender, mean, standard deviation and standard error values.

Independent Samples Test

Parameters		Levene's Test for Equality of Variances		t-test for Equality of Means						
									Interval of the	
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Urea	Equal variances assumed	1,464	,229	-6,072	102	,000	-7,62600	1,25599	-10,11725	-5,13475
	Equal variances not assumed			-6,170	95,386	,000	-7,62600	1,23603	-10,07969	-5,17231
Creatinine	Equal variances assumed	5,911	,017	-8,239	102	,000	-,14792	,01795	-,18353	-,11231
	Equal variances not assumed			-8,684	101,815	,000	-,14792	,01703	-,18171	-,11413
AST	Equal variances assumed	1,638	,203	-2,612	102	,010	-2,79604	1,07057	-4,91951	-,67256
	Equal variances not assumed			-2,684	98,190	,009	-2,79604	1,04176	-4,86332	-,72875
ALT	Equal variances assumed	4,213	,043	-2,954	102	,004	-6,44415	2,18125	-10,77065	-2,11765
	Equal variances not assumed			-3,038	98,345	,003	-6,44415	2,12104	-10,65310	-2,23519
Hgfh	Equal variances assumed	,299	,586	-1,487	102	,140	-2,80747	1,88827	-6,55284	,93790
	Equal variances not assumed			-1,489	91,134	,140	-2,80747	1,88498	-6,55169	,93674
WBC	Equal variances assumed	,481	,489	-,160	102	,873	-,05721	,35716	-,76563	,65120
	Equal variances not assumed			-,161	92,915	,872	-,05721	,35450	-,76118	,64676
RBC	Equal variances assumed	,405	,526	-4,939	102	,000	-,49692	,10062	-,69649	-,29734
	Equal variances not assumed			-4,857	84,989	,000	-,49692	,10231	-,70033	-,29350
HGB	Equal variances assumed	,507	,478	-9,687	102	,000	-2,53565	,26177	-3,05486	-2,01643
	Equal variances not assumed			-9,614	88,113	,000	-2,53565	,26373	-3,05975	-2,01154
HCT	Equal variances assumed	,414	,521	-9,416	102	,000	-6,27991	,66695	-7,60280	-4,95701
	Equal variances not assumed			-9,318	87,109	,000	-6,27991	,67396	-7,61946	-4,94036
PLT	Equal variances assumed	4,622	,034	4,421	102	,000	42,03355	9,50762	23,17523	60,89186
	Equal variances not assumed			4,246	76,708	,000	42,03355	9,90006	22,31881	61,74829
MCH	Equal variances assumed	3,353	,070	-3,241	102	,002	-1,75454	,54139	-2,82838	-,68071
	Equal variances not assumed			-3,095	74,745	,003	-1,75454	,56697	-2,88408	-,62501
MCV	Equal variances assumed	1,066	,304	-2,113	102	,037	-2,55421	1,20859	-4,95144	-,15698
	Equal variances not assumed			-2,056	81,181	,043	-2,55421	1,24238	-5,02608	-,08235
MCHC	Equal variances assumed	9,373	,003	-5,256	102	,000	-1,25608	,23896	-1,73005	-,78211
	Equal variances not assumed			-4,947	69,898	,000	-1,25608	,25393	-1,76253	-,74963
PCT	Equal variances assumed	9,244	,003	5,547	102	,000	,05235	,00944	,03363	,07107
	Equal variances not assumed			5,200	68,645	,000	,05235	,01007	,03226	,07243
MPV	Equal variances assumed	,911	,342	,773	102	,441	,12402	,16038	-,19410	,44214
	Equal variances not assumed			,757	83,433	,451	,12402	,16381	-,20176	,44980
PDW	Equal variances assumed	,862	,355	,384	102	,702	,14163	,36860	-,58948	,87274
	Equal variances not assumed			,374	81,612	,709	,14163	,37843	-,61125	,89451
EOSPercent	Equal variances assumed	1,017	,316	-,357	102	,722	-,10658	,29880	-,69925	,48608
	Equal variances not assumed			-,332	66,502	,741	-,10658	,32093	-,74726	,53409
LYMP	Equal variances assumed	,109	,742	-1,945	102	,055	-,24783	,12744	-,50061	,00496
	Equal variances not assumed			-1,964	93,609	,053	-,24783	,12620	-,49842	,00276
LYMPPercent	Equal variances assumed	7,176	,009	-1,169	102	,245	-1,80370	1,54263	-4,86350	1,25610
	Equal variances not assumed			-1,086	65,728	,282	-1,80370	1,66108	-5,12040	1,51300
MONOPercent	Equal variances assumed	,458	,500	-2,572	102	,012	-,93526	,36369	-1,65664	-,21389
	Equal variances not assumed			-2,633	97,332	,010	-,93526	,35522	-1,64024	-,23029
BASOPercent	Equal variances assumed	2,457	,120	-1,074	102	,286	-,04072	,03792	-,11594	,03450
	Equal variances not assumed			-1,114	100,054	,268	-,04072	,03655	-,11323	,03180
NEUPercent	Equal variances assumed	3,721	,057	2,085	102	,040	3,32714	1,59613	,16122	6,49307
	Equal variances not assumed			1,994	75,357	,050	3,32714	1,66857	,00344	6,65085
NEU	Equal variances assumed	1,066	,304	,450	102	,653	,12611	,28000	-,42927	,68149
	Equal variances not assumed			,436	79,334	,664	,12611	,28936	-,44981	,70202
EOS	Equal variances assumed	,460	,499	-,657	102	,513	-,01595	,02428	-,06411	,03221
	Equal variances not assumed			-,625	73,794	,534	-,01595	,02550	-,06676	,03486
BASO	Equal variances assumed	,051	,822	-,822	102	,413	-,00253	,00308	-,00864	,00358
	Equal variances not assumed			-,831	93,971	,408	-,00253	,00305	-,00858	,00352
MONO	Equal variances assumed	2,713	,103	-2,477	102	,015	-,08461	,03417	-,15238	-,01685
	Equal variances not assumed			-2,599	101,509	,011	-,08461	,03256	-,14919	-,02003
PLCR	Equal variances assumed	,333	,565	,554	102	,581	,79604	1,43755	-2,05534	3,64741
	Equal variances not assumed			,548	87,037	,585	,79604	1,45296	-2,09187	3,68394
RDWCV	Equal variances assumed	13,207	,000	3,373	102	,001	,93801	,27811	,38638	1,48964
	Equal variances not assumed			3,145	66,972	,002	,93801	,29826	,34268	1,53334
RDWSD	Equal variances assumed	4,105	,045	2,637	102	,010	1,56207	,59238	,38707	2,73706
	Equal variances not assumed			2,460	67,169	,016	1,56207	,63490	,29485	2,82928
IG	Equal variances assumed	3,277	,073	-1,699	102	,092	-,00452	,00266	-,00980	,00076
	Equal variances not assumed			-1,802	101,999	,074	-,00452	,00251	-,00950	,00046
IGPercent	Equal variances assumed	1,416	,237	-1,780	102	,078	-,05974	,03356	-,12631	,00683
	Equal variances not assumed			-1,914	101,265	,058	-,05974	,03121	-,12166	,00217

Figure 2. The Statistics of Clinical Biochemistry Laboratory Data for the Workers

Figure 2 Explanation: AST (Aspartate Aminotransferase), ALT (Alanine aminotransferase) eGFR (Estimated glomerular filtration rate), WBC (White blood cell; leukocyte count), RBC (Red blood cell, Red blood cell count), HGB (Hemoglobin), HCT (Hematocrit), PLT (Platelet), MCH (Mean Corpuscular Hemoglobin; Average Cell Hemoglobin), MCV (mean erythrocyte volume), MCHC (Average Cell Hemoglobin Concentration), PCT (Percent ratio of platelet cells to other cells), MPV (Average platelet volume), PDW (Platelet Distribution Width), EOS (Eosinophil), LYM (Lymphocyte), MONO (Monocyte), BASO (Basophil), P-LCR (Large platelet cell ratio), RDW-CV (Erythrocyte distribution width-coefficient variation-coefficient of variation), RDW-SD (Erythrocyte distribution width-standard deviation), IG (Immature Granulocyte). Percent: Percentage (%). Biochemical parameters were compared between groups according to gender with the parametric Independent Samples T Test. $p<0.05$= Statistically significant difference.

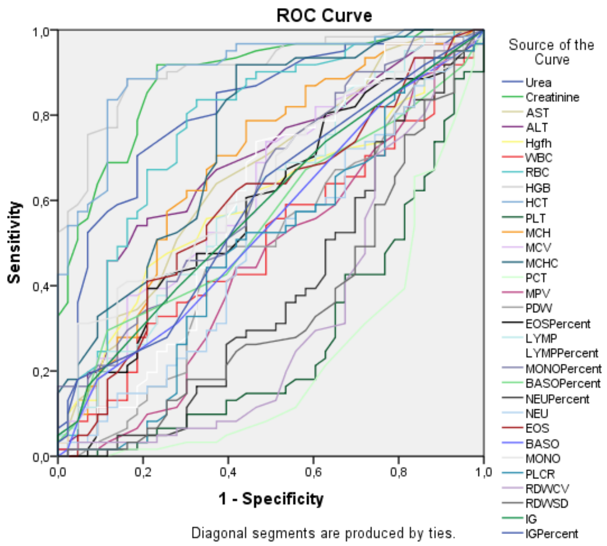

Figure 3. Roc Curve of Laboratory Parameters

Area Under the Curve					
Test Result Variable(s)	Area	Std. Error[a]	Asymptotic Sig.[b]	Asymptotic 95% Confidence Interval: Lower Bound	Upper Bound
Urea	,814	,043	,000	,729	,898
Creatinine	,888	,032	,000	,824	,951
AST	,660	,054	,006	,553	,767
ALT	,686	,053	,001	,582	,790
Hgfh	,599	,056	,087	,489	,708
WBC	,504	,057	,939	,392	,617
RBC	,779	,048	,000	,684	,874
HGB	,912	,027	,000	,858	,966
HCT	,906	,029	,000	,849	,964
PLT	,274	,051	,000	,173	,375
MCH	,688	,054	,001	,581	,794
MCV	,624	,056	,031	,515	,734
MCHC	,748	,050	,000	,650	,846
PCT	,226	,049	,000	,131	,321
MPV	,457	,059	,460	,342	,573
PDW	,496	,059	,945	,380	,612
EOSPercent	,584	,058	,146	,471	,697
LYMP	,611	,057	,054	,501	,722
LYMPPercent	,593	,060	,107	,476	,711
MONOPercen t	,632	,055	,022	,524	,741
BASOPercent	,555	,056	,345	,444	,665
NEUPercent	,384	,058	,045	,270	,498
NEU	,487	,059	,817	,372	,601
EOS	,589	,057	,124	,477	,701
BASO	,544	,057	,446	,432	,656
MONO	,638	,054	,017	,532	,745
PLCR	,483	,060	,769	,366	,600
RDWCV	,323	,058	,002	,210	,436
RDWSD	,350	,056	,010	,240	,460
IG	,585	,056	,142	,474	,695
IGPercent	,587	,057	,130	,476	,699

The test result variable(s): Urea, Creatinine, AST, ALT, Hgfh, WBC, RBC, HGB, HCT, PLT, MCH, MCV, MCHC, PCT, MPV, PDW, EOSPercent, LYMP, LYMPPercent, MONOPercent, BASOPercent, NEUPercent, NEU, EOS, BASO, MONO, PLCR, RDWCV, RDWSD, IG, IGPercent has at least one tie between the positive actual state group and the negative actual state group. Statistics may be biased.

a. Under the nonparametric assumption

b. Null hypothesis: true area = 0.5

Figure 4. Area Under Curve of Laboratory Parameters

The reason of higher PCT (Percent ratio of platelet cells to other cells) values as observed in Table 1 and 2, may be one of the reasons why PLT is significantly higher in women.[5] Thus, the lower MCHC, HGB, HCT, RBC and MCV in women, it can be explained with a lower hemoglobin level compared to men.[5] It is an expected difference for AST and ALT by gender, considering that the AST and ALT values are higher in males and the mean values for both genders are within the reference range.6 The mean age and standard deviation of female and male groups were respectively 34.86 ± 6.15 and 33.23 ± 5.80 (mean ± standard deviation). The mean age of total workers was 33.90 ± 5.97. Thanks to the relatively young age of the participating workers, the laboratory results remained within the reference range.

Including the fasting blood glucose values in routine clinical laboratory tests requested scope of workplace medicine may be useful in the early diagnosis and prevention of increasingly frequent insulin resistance, obesity and type 2 diabetes mellitus.[7]

Examination in the workplace performed periodically under labor legislation provides information on the workplace conditions, as well as on organ function disorders, changes in blood cells, and blood structure in the overall employee population. The aim is early diagnosis and treatment of any disease. Periodic examinations and clinical laboratory tests on employees may help prevent the diagnoses of occupational disease in approximately 10 million employees and save more than 3 million lives annually on a global scale.[1] It is a legal obligation to carry out routine occupational health examinations of workers effectively and to evaluate the desired laboratory parameters in detail.[8] Although there are many studies on occupational health and safety in the literature, biochemical parameters were not examined in these studies.[9-14] Or, specific intoxications related to occupational health were examined.[15] For this reason, the biochemical data presented in our study are unique and important in terms of guiding occupational health safety.

The narrow age range of the workers in our study is a limitation. In new studies, the effects of age range on laboratory parameters can be examined with a wider sample. However, the strength of the study is that it is one of the first studies in the literature to include biochemical data of workers' routine occupational health screenings.

Laboratory parameters to be required in routine occupational health examinations should be determined by considering the nature of the work and the hazard class. Then the biochemical results should be carefully analyzed. In this way, early diagnosis, preventive medicine and treatment will be possible.

CONCLUSION

Increasing research and publications on clinical laboratory data obtained in the course of workplace medical procedures will facilitate research within the framework of occupational health and safety and will help early diagnosis and treatment of diseases. Fasting blood glucose level should be included among the laboratory parameters required in routine occupational health screenings. Thus, it may be beneficial for the early diagnosis of insulin resistance obesity and type 2 diabetes. Our study contributes original and unique data to the literature in terms of clinical biochemistry knowledge in occupational health. Occupational Health and Safety (OHS) is defined as the science of forecasting, recognizing, evaluating and controlling the dangers that may impair the health and well-being of employees, that may arise in the workplace or that may arise from the workplace, taking into account the possible effects on the society and the general environment. The main purpose in occupational health and safety is to protect all employees against occupational diseases, work accidents and work-related diseases. In this study, it was aimed to examine the biochemical data included in the routine health examinations, which are one of the main activities related to occupational health and safety, and to draw attention to the importance of these data. The main purpose of the occupational health and safety team and the workplace doctor is to create a healthy working environment in the workplace. In this way, work accidents, occupational diseases and work-related diseases can be prevented before they occur. For this reason, our research results are important for improving occupational health.

Acknowledgements Protection of Humans

The authors declare that the procedures were followed according to the regulations established by the Clinical Research and Ethics Committee and to the 2013 Helsinki Declaration of the World Medical Association.

Data Confidentiality

The authors declare having followed the protocols in use at their working center regarding patients' data publication.

Conflicts of Interest

The authors declare no conflicts of interest.

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