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Research Article

Study of Biological Parameters of Schizophrinics During 6 Months of Different Anti Psychotics Treatment

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Abstract

Objective: The aim is to study the impact of antipsychotics on schizophrenic's metabolic parameters in 6 months.

Methods: Blood glucose, lipid profile, liver enzymes weight & waist circumference were assessed for 160 schizophrenia patients; at the beginning and after 6 months of continuous use of antipsychotics. Patients with who used antipsychotics in the past 3 months or have family history of diabetes or obesity were excluded.

Results: Except for white blood count and High-Density Lipoproteins (HDL); all the studied parameters showed significant elevation after 6 months of antipsychotic treatment. The relation between the type of antipsychotic and the studied parameters showed that the lipid profile was the only parameter of significance in relation to drug type. Because not only the lipid profile but also other parameters increased after six months we used analysis of covariance [ANCOVA] which showed that the value of any studied parameters at the beginning of the study was significantly determine the values at the end of the study, in addition, the type of drug used in treatment is significantly influences the triglyceride level and interaction of sex, drug used, and the history of drug treatment could significantly determine the serum cholesterol and LDL levels.

Conclusion: The study demonstrated elevated metabolic parameters in patients with schizophrenia treated with antipsychotics. The burden of each antipsychotic was explored. More research is needed to confirm our findings which are limited by the short duration of the study, the fewer number of studied antipsychotics and sample size

Keywords: Antipsychotics; Schizophrenia; Metabolic

Abbreviations

FBS: Fasting Blood Sugar; PP: Post Prandial Blood Sugar; TG: Triglycerides; LDL: Low Density lipoproteins; HDL: High Density Lipoproteins; SGOT: Serum Glutamic Oxalo-Acetic Transferase; SGPT: Serum Glutamic-Pyruvic Transferase; BW: Body Weight; WCC: Waist Circumference; TLC: Total Leucocytic Count; ANOVA: Analysis of Variance

Introduction

Many studies reported increased rate of morbidity [1] and mortality [2-4] in mentally ill population. The increased rate of conditions like diabetes mellitus [5-7], cardiovascular disorders [8,9] and obesity [10,11] particularly abdominal adiposity and visceral abdominal fat which is incriminated in diminished insulin sensitivity that leads to diabetes [12,13]. Many factors were attributed to these metabolic changes including the life style issues like poor nutritional habits and reduced activity or even the disease process itself [14-18]. However, the antipsychotic medications have been largely incriminated in this respect. This stimulate some author to make extensive reviewing and collect evidence for and against an association between glucose or lipid deregulation and eight separate second-generation antipsychotics currently available worldwide, specifically clozapine, olanzapine, risperidone, quetiapine, zotepine, amisulpride, ziprasidone and aripiprazole. Reports of adverse effects of antipsychotics on glucose and lipid metabolism have more frequently associated with some antipsychotics specially clozapine [19] and olanzapine [20] and less with quetiapine or risperidone [21]. Other reports of limited short or long terms weight gains with drugs like ziprasidone and aripiprazole [22,23]

Studies drawn from the US FDA Med Watch database demonstrated the new cases of type II diabetes mellitus associated with clozapine, olanzapine and risperidone were associated with weight gains and as many as half of these cases were associated with family history of diabetes [24]. However, tow cross-sectional studies suggested that weight gain may not explain all the observed adverse metabolic side effects in the patients [25,26].

All the above-mentioned worries should not ignore the unequivocal impact of the novel antipsychotics. Although conventional antipsychotic drugs are clearly a boon to the treatment of psychotic illnesses, their limitations are well-known. As many as two-thirds of patients with schizophrenia will have only a partial symptom response and will be left to cope with residual symptoms. The advent of clozapine offered new hope for many such treatment-resistant patients because of its superior clinical efficacy compared with conventional antipsychotics. Numerous studies have demonstrated that clozapine offers some treatment-resistant patients remarkable

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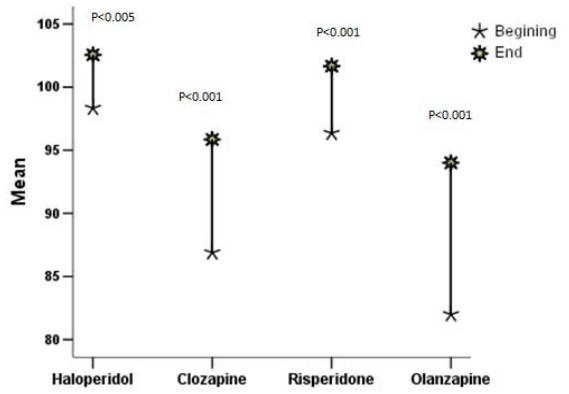

Figure 1(a): Mean values of changes of fasting Blood Glucose during the study. Significant difference between changes happened in haloperidol treated group and both clozapine treated group (P<0.05), and olanzapine treated group (P<0.02), and between olanzapine treated group and Risperidone treated group (P<0.02).

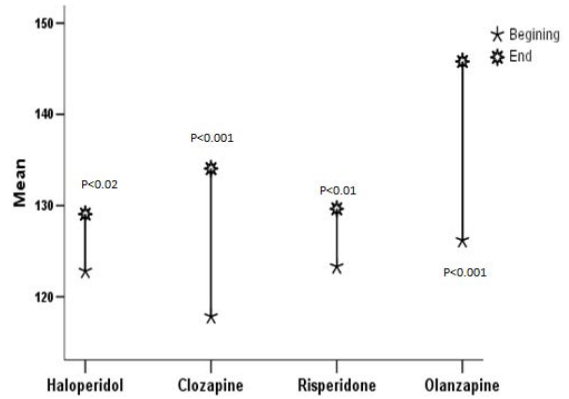

Figure 1(b): Mean values of changes of post prandial Blood Glucose during the period of the studySignificant difference between changes happened in haloperidol treated group and clozapine treated group (P<0.05), clozapine treated group and Risperidone treated group (P<0.05) and Risperidone treated group and olanzapine treated group (P<0.05).

improvement in positive symptoms such as hallucinations and delusions [27-31].

The aim of this work is to study the biochemical changes including metabolic parameters after six months of continuous treatment and to test the role of antipsychotic medications (haloperidol, clozapine, risperidone and olanzapine) in these changes. This may help in selection of the suitable medication and the precautions that will cause the patient's benefit outweigh the adverse effects.

Subjects and Methods

This prospective cohort comparative study was carried out in Neuropsychiatry departments, Tanta University hospital from January 2010 to November 2012 and conducted on One hundred and sixty patients with schizophrenia and fifty healthy volunteers as control. They were enrolled through convenience sampling. A written informed consent from obtained from every individual (patient & control) enrolled in the study, this consent was written by patient or the legal sponsor - based on the degree of reality testing of the patient - after explaining the aim of the study and the procedures in which the patient will be involved All subjects related data were kept confidential. Patient and /or his legal sponsor were given the right to withdraw at any step of the research. All these ethical procedures were reviewed, approved and monitored by the faculty of medicine Tanta university research ethics committee.

At the end of the period, the number of patients that fulfilled these criteria was 190 schizophrenic patients (59 on Haloperidol, 48 on Clozapine, 45 on Risperidone and 38 on Olanzapine). Patient were compared with 50 healthy control matched with patient's age and sex [p>0.5] and coming from the same social and cultural background, the biological parameters of this control sample were compared with that of the patient at the beginning of the study.

Patients were clinically evaluated by The Mini-International Neuropsychiatric Interview [32] Arabic version [33] and the diagnosis was made according to DSM-IV-TR [34] diagnostic criteria. In addition to the clinical evaluation which included duration of illness, type of schizophrenia and detailed drug history. Measurement of body weight & waist circumference [35] in addition to physical examination to exclude any organic disease were also performed.

Llaboratory studies including

1. Fasting and post prandial blood glucose levels [36]

2. Total leucocytic count.

3. Liver function tests: liver enzymes

4. Lipid profile including: serum cholesterol, triglycerides, LDL and HDL level. [37]

All patients will be submitted to these tests at the start, and 6months after start of research.

Exclusion criteria

1. Patients receiving any drugs other than antipsychotics.

2. Patients suffering from any metabolic problem such as diabetes, obesity, renal or liver impairment before administration of antipsychotics.

3. Family history of any metabolic problem such as diabetes, obesity

Statistical analysis

The hypothesis beyond this study was that the morbidity" particularly metabolic syndrome "in patients with schizophrenia is more than general population matched with age and sex this could be due to various factors e.g. the disease itself, the life style of the patient and/or the effect of antipsychotic medications. In our sample we tried to find any changes in the values of some biological parameters that may carry increased morbidity risk in patients after 6 months of continuous treatment with antipsychotics and any role of the type of antipsychotics in these changes after controlling other factors that may cause such changes. To reach these goals we use computer based statistical package (SPSS version 13 under windows). The following statistical analysis was done:

The difference in the mean values of the studied biological parameters between patients and control cases was calculated using t test for independent variables. The nonparametric version of the test was used to deal with the difference between number patients and

Table 1: Differences in mean values of biological parameter between patients and control at the beginning of the study.

			Mean	Std. D	t	df	P	95% Confidence Interval	
								Lower	Upper
Blood Glucose	F.B. S	Control	88.74	11.611	-1.22	238	0.22	-7.75	1.81
		Patients	91.71	16.080					
	PP	Control	111.04	17.157	-3.87	238	0.00	-17.06	-5.56
		Patients	122.35	18.668					
Serum Lipid Profile	Cholesterol	Control	158.94	31.239	-3.69	238	0.00	-25.52	-7.74
		Patients	175.57	27.603					
	TG	Control	99.46	33.197	-4.00	238	0.00	-47.45	-16.11
		Patients	131.24	53.559					
	LDL	Control	122.24	22.880	1.26	238	0.21	-3.12	14.30
		Patients	116.65	28.961					
	HDL	Control	49.66	11.783	1.16	238	0.25	-1.10	4.25
		Patients	48.08	7.480					
Morphological Changes	BW	Control	79.84	11.229	3.18	238	0.00	2.59	11.00
		Patients	73.05	13.950					
	WCC	Control	90.76	13.502	1.13	238	0.262	-1.70	6.26
		Patients	88.51	12.374					
Liver Enzymes	SGOT	Control	27.60	10.874	1.56	238	0.12	-0.79	6.68
		Patients	24.65	12.178					
	SGPT	Control	28.36	13.155	1.71	238	0.09	-0.51	7.09
		Patients	25.07	11.848					
TLC		Control	8294.00	1485.22	3.89	238	0.00	542.88	1655.64
		Patients	7194.74	1845.02					

Table 2: Estimated marginal mean value at the end of the study in every drug treated group.

Antipsychotic medication	Blood glucose		Serum Lipid Profile				Morphological changes		Liver enzymes		WBC
	FBS	PP	Cholesterol	TG	LDL	HDL	Body weight	Waist circumference	SGOT	SGPT	
Haloperidol	95.92	131.29	198.31	126.24	118.97	47.23	73.69	90.23	26.95	25.83	7232.17
Clozapine	101.77	141.20	197.50	156.27	142.71	47.08	75.13	90.72	26.72	28.46	6887.80
Risperidone	97.16	130.09	204.14	191.24	137.67	50.81	73.79	89.41	26.65	26.39	7596.81
Olanzapine	105.78	141.37	201.75	137.11	128.89	42.18	76.10	90.32	29.99	27.80	7673.91
ANOVA F	2.75	3.77	0.58	21.49	18.01	7.60	37.85	63.99	18.12	113.36	5.04
ANOVA df	3	3	3	3	3	3	3	3	3	3	3
ANOVA p	0.10	**0.048**	0.640	**0.000**	**0.000**	**0.006**	**0.000**	**0.000**	**0.000**	**0.000**	**.02**

number of control samples.

The difference in mean values of the studied biological parameters after 6 months of antipsychotic treatment we used paired t test to compare the mean values at the beginning of the study with at the value at end of the study for each group of patients.

Analysis of variance was to calculate the effect of treatment with antipsychotic medication on each the biological parameter. We used general linear model to test the interaction among the variable of possible influence on the values. The mean value of each studied biological parameter at the end of the study as dependent variable. Type of drug used of treatment as variable of fixed effect. Age, gender, duration of illness and any previous history of antipsychotic medication as variable with random effect and the mean value of the same biological variable as a covariance. Intercept was included in the equation. Post Hoc multiple comparison analyses of Least Significance Difference (LSD) was used to calculate the mean difference in the change of value between each two drugs. All the mean values are "estimated marginal means" calculated after considering the interaction of all variables. This model gives 2 level of significance, the first level is the effect of the factor of treatment in the whole model and the second level is the effect of drug on the end value of each biological parameter.

Results

Although the patients are of age, sex and social background match with the control sample albeit difference in post prandial glucose, blood cholesterol, TG, body weight and total leukocyte count was

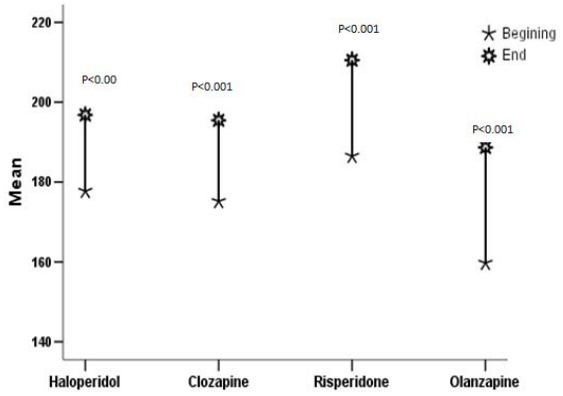

Figure 2(a): Mean values of changes of blood Cholesterol during the period of the study. Post-Hoc pair wise comparison showed that no significant difference in changes of serum cholesterol among the 4 drug groups (P>0.05).

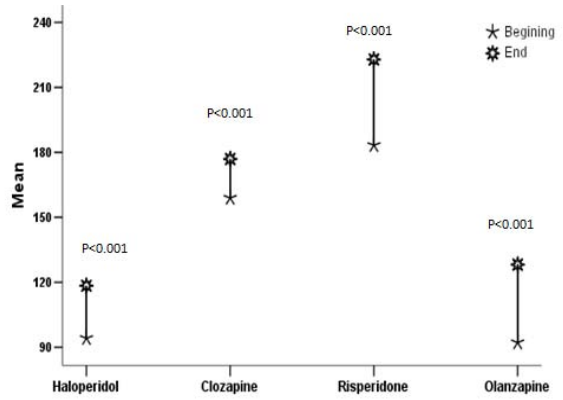

Figure 2(b): Mean values of changes of blood TG during the period of the study. Post Hoc pair wise comparison showed significant difference in haloperidol treated group from both Risperidone treated group and olanzapine treated group ($p<0.05$) in addition Risperidone treated group is also different from clozapine treated group ($P<0.01$).

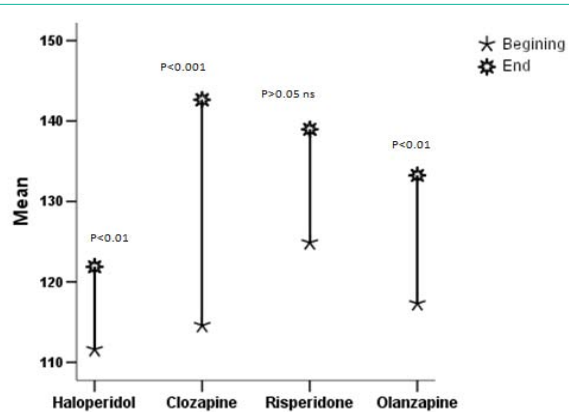

Figure 2(c): Mean values of changes of blood LDL during the period of the study. Serum LDL in haloperidol treated group is significantly different from clozapine and Risperidone ($p<0.01$) and olanzapine ($p<0.05$) the same between clozapine and olanzapine.

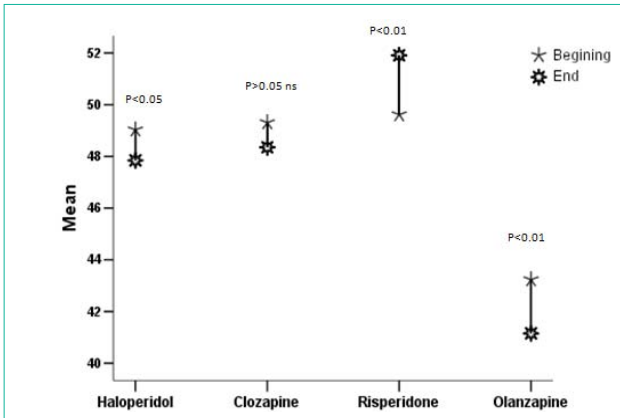

Figure 2(d): Mean values of changes of blood HDL during the period of the study. Olanzapine treated group showed significant decrease in HDL while Risperidone treated group showed the height increase in HDL.

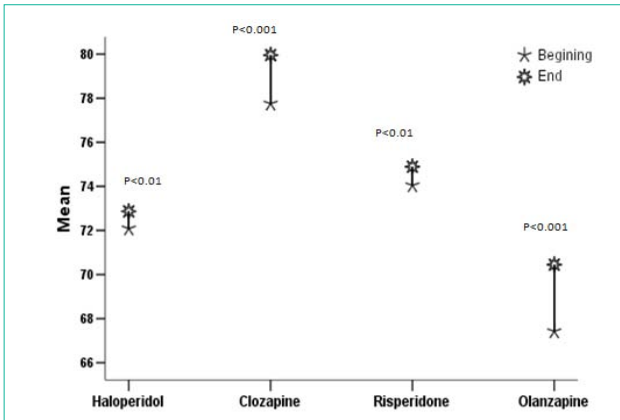

Figure 3(a): Mean values of body weight changes during the period of the study, No significant difference in changes body weight between haloperidol treated group and Risperidone treated group but each one of them is significantly different from both clozapine and olanzapine ($P<0.01$).

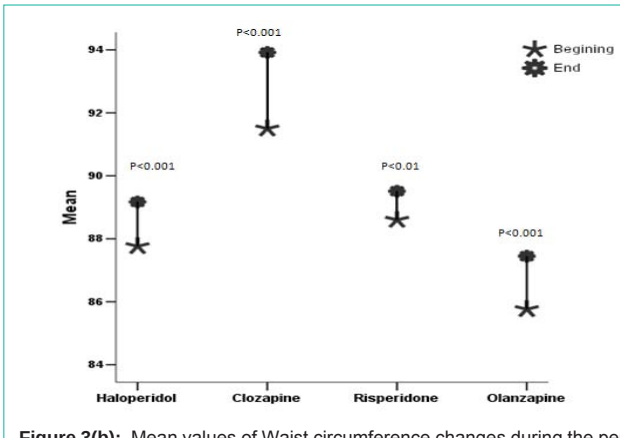

Figure 3(b): Mean values of Waist circumference changes during the period of the study. Risperidone the least significant difference in changes of waist circumference compared to other 3 groups ($p<0.001$). Haloperidol treated group is also significantly less than clozapine treated group ($p<0.05$). Other comparisons are not significant.

found (Table 1). The changes in mean values of biological parameters between the beginning and the end of the study in the same drug-treated group and the difference between one group and other was calculated as estimated marginal mean after testing the interaction of all variables. The type of drug showed significant effect on the biological parameters in this interaction except in the end of the study

fasting Blood Glucose and serum cholesterol (Table 2).

Blood Glucose

The model of interaction showed that antipsychotic treatment contribution in the changes of Blood Glucose was significant for fasting Blood Glucose [mg/dl] [F=4.87, df=179, p=0.004] and not significant for post prandial Blood Glucose [F=1.64, df=179, p=0.20], this means that the factor of treatment with antipsychotic is not a contributing factor in the changes in post prandial Blood Glucose in such model of interaction. The type of drug is not of significance in fasting Blood Glucose [F=2.75, df=3, p=0.10 ns] and weakly significant in post prandial [F=3.77, df= 3, P=0.05]. Olanzapine and clozapine treated groups showed the highest mean changes in fasting and PP Blood Glucose while haloperidol and Risperidone treated groups showed the lowest changes (Figure 1(a,b)).

Serum lipid profile

The antipsychotic treatment contribution in these changes after interaction with other factors within the model showed that the contribution to cholesterol changes was not significant [F=1.24, df =179, P=0.38]. This means that the change in serum cholesterol is due to other factors than the drugs. The role of antipsychotic treatment within the model was significant for other 3 lipid components [F=17.81, df= 179, P=0.00 for triglycerides, F= 4.74, df= 179, P=0.01 for LDL & F=3.16, df=179, P=0.02 for HDL]. The significance of the type of medication used for treatment was not significant for serum cholesterol [F=0.58, df= 3, P=0.6], and significant for another component [F=21.49, df=3, P=0.00 for TG, F18.01, df=3, P=0.00 for LDL & F= 7.60, df=3, P=0.01]. Risperidone treated group showed the highest increase in serum cholesterol (Figure 2a), TG (Figure 2c) and HDL and clozapine treated group showed the highest increase in LDL (Figure 2c). The interesting finding is the statistically significant reduction of the mean value of HDL in olanzapine treated group (Figure 2d).

Morphological changes

The antipsychotic treatment contribution in these changes is statistically significant within the model [F=167.44, df=179, P=00 for body weight & F=846.23, df=179, P=00 for waist circumference]. The type of medication used showed significant difference within the 4 groups [F=37.85, df=3, p=0.00 for body weight & F=63.986, df=3, p=0.00]. Patient showed increase in the body weight and waist circumference during the period of the study particularly in clozapine and olanzapine treated groups. Risperidone treated group showed the least morphological changes among other three groups but even in this group the changes were statistically significant (Figure 3a,b).

Liver enzymes

Role of the factor of antipsychotic treatment in liver enzyme changes in our model was statistically significant for both SGOT [F=38.47, df=179, P=0.000] and SGPT [F=392.48, df=179, P=0.000]. The type of drug used for treatment was also significant [F=18.12, df=3, P=0.000 for SGOT and F=113.36, df= 3, P= 0.000 for SGPT]. Olanzapine treated group showed the highest changes then followed by clozapine treated group, haloperidol and Risperidone treated groups are the lowest (Figure 4a,b).

Total leukocyte count

Role of the factor of antipsychotic treatment in liver enzyme changes in our ANOVA model was statistically significant [F=3.49, df= 179, p=0.02]. The type of drug used for treatment was also significant [F=5.04, df=3, p=0.02]. Haloperidol treated group

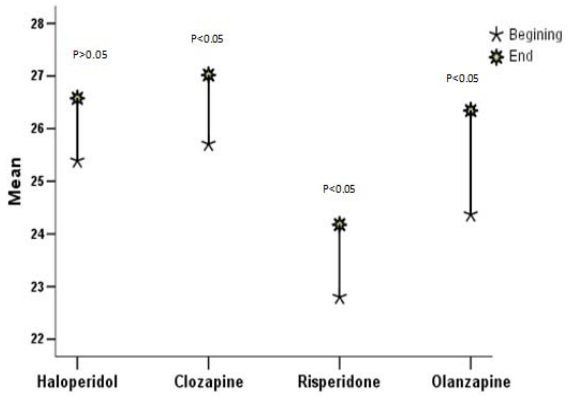

Figure (4a): Mean values of SGOT changes during the period of the study. The mean value of change in olanzapine treated group is statistically significant compared to changes in other 3 groups (P<0.001). Other comparisons were not significant.

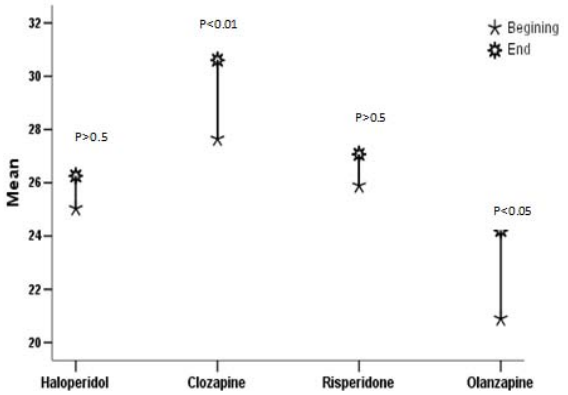

Figure 4(b): Mean values of SGPT changes during the period of the study. The mean value of change in both olanzapine and clozapine treated groups are statistically significant compared with either haloperidol or risperidone treated group (p<0.01). Still changes in olanzapine treated group is more than clozapine treated group.

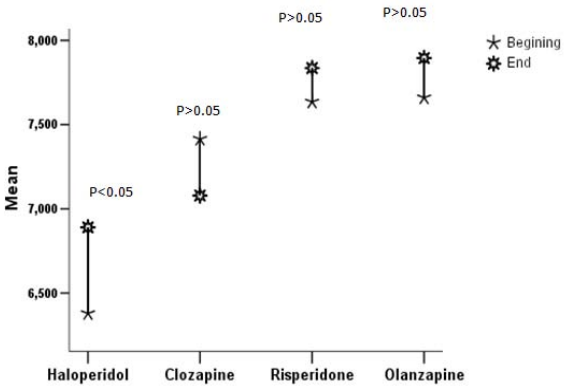

Figure 5: Mean values of changes in Total leukocyte count during the period of the study. Clozapine treated group showed the highest statistically significant changes among other groups.

Table 3: The changes in the mean values of the biological parameters in different drug treated groups (difference between beginning and end).

Biological parameters		Haloperidol		Clozapine		Risperidone		Olanzapine	
		Mean difference	P	Mean difference	P	Mean difference	P	Mean difference	P
Blood Glucose	F.B. S	-4.22	**0.00**	-8.96	**0.00**	-5.31	**0.00**	-12.00	**0.00**
	PP	-6.25	**0.02**	-16.21	**0.00**	-6.33	**0.01**	-19.61	**0.00**
Serum Lipid Profile	Cholesterol	-19.05	**0.00**	-20.29	**0.00**	-24.00	**0.00**	-28.90	**0.00**
	TG	-24.22	**0.00**	-18.00	**0.00**	-39.62	**0.00**	-35.97	**0.00**
	LDL	-10.27	**0.00**	-28.04	**0.00**	-14.09	0.09	-15.92	**0.00**
	HDL	1.19	**0.03**	0.96	0.27	-2.29	**0.01**	2.08	**0.00**
Morphological Changes	BWin kg	-0.78	**0.00**	-2.21	**0.00**	-0.84	**0.00**	-3.03	**0.00**
	WCC in cm	-1.41	**0.00**	-2.42	**0.00**	-0.91	**0.00**	-1.68	**0.00**
Liver Enzymes	SGOT	-1.19	0.09	-1.31	**0.02**	-1.38	**0.02**	-1.97	0.20
	SGPT	-1.22	0.09	-2.96	**0.00**	-1.18	0.11	-3.32	**0.02**
TLC		-510.17	0.01	335.42	0.26	-200.00	0.45	-234.21	0.35

showed significant rise in the total leukocyte count, Risperidone and olanzapine showed no significant rise also but clozapine showed no significant decrease in the total leukocyte count (Figure 5).

Discussion

Our study revealed significant elevation of biological parameters in patients of schizophrenia than control cases. This elevation is becoming more significant by the end of the study than at the start (Table 2). These finding confirm the notion that the mentally ill in general [38] and schizophrenics [39] are at risk of high morbidity and mortality than general population. Life style, disease and medications are the incriminated causes of this risk [18,40-42]. The abnormalities of glucose regulation were reported long time ago in mentally ill patients in general and in schizophrenics [43-46] even in drug naïve patients [47].

Our study demonstrated that antipsychotic treatment as a factor of effect on the model of interaction has an impact on biological changes more over the type of drug used is also has differential effect. Olanzapine and clozapine treated groups showed the highest mean changes in fasting and PP Blood Glucose while haloperidol and Risperidone treated groups showed the lowest changes these findings confirming many studies. Previous study [48] did not find any significant changes in serum glucose in patients treated with the same group of antipsychotics [with the exception of olanzapine $P<0.02$] after 14 weeks of follow up. Risperidone treated group showed the highest increase in serum cholesterol, TG and HDL and clozapine treated group showed the highest increase in LD. The interesting finding is the statistically significant reduction of the mean value of HDL, this needs further research to prove or disprove some studies [49] reported non-significant change in HDL with clozapine treatment in olanzapine treated group. Several studies showed increased TG with clozapine [50] and olanzapine [51] while non-significant changes of cholesterol with risperidone. Studies [52] reported that risperidone has less impact on lipid profile compared to olanzapine.

Olanzapine treated group showed the highest changes in Liver enzymes followed by clozapine treated group, haloperidol and Risperidone treated groups are the lowest. The effect on hepatic enzymes was reported by many studies [53] one study [54] reported that the raised lever enzymes could predict metabolic syndrome in patients with schizophrenia

Patient showed increase in the body weight and waist circumference during the period of the study particularly in clozapine and olanzapine treated groups.

In our study Patient showed increase in the body weight and waist circumference during the period of the study particularly in clozapine and olanzapine treated groups. Risperidone treated group showed the least morphological changes among other three groups but even in this group the changes were statistically significant. studies identify predictive factors of acute weight change in patients with schizophrenia. Similar factors across antipsychotic drugs in predicting greater weight gain included better clinical outcome, low BBMI, and nonwhite race. Factors differing between conventional [haloperidol] and atypical [olanzapine] agents included increased appetite and gender ere associated these differences to factors like. studies [55] claimed that adiponectin as a potential biomarker for the metabolic syndrome in clozapine treated patient, while others [56] regard the anthropometric parameters as indicators of metabolic derangements in schizophrenia patients stabilized on olanzapine. The complex inter-effect of the parameter and the unclear direct biochemical link between drug molecule and the increased body fat deposition confirm the assumption that antipsychotics should not be regarded the sole element for abnormal metabolic disturbance. Some authors [57,58] emphasized the importance of appropriate baseline screening and ongoing monitoring of weight gain and long-term weight management facilities may help to reduce weight gain in some patients.

Conclusion

From the results of this study we can confirm the previous conclusions that metabolic disturbance in patients of schizophrenia is realty and worsens by time. Antipsychotics treatment may contribute in this effect particularly the novel ones but this effect could be a perpetuating or precipitating. The significant difference between patients and control at the beginning of the study makes us unable to go beyond this conclusion Calculating the risks and benefits of the use of antipsychotics is an important contributing factor in

lowering both psychiatric and physical morbidity of our patients. This calculation should not only consider the type of antipsychotic but also other factors like the nature of the illness the stress, the lifestyle and nutritional habits of the patients. This should raise our awareness about the continuous monitoring not only the side effects of the drugs but also the quality of life and healthcare delivery of our patients.

Our study is one of the view prospective studies that considered a wide range of biological profile of both typical and atypical antipsychotics for a considerable period and not funded by third party. However, our findings and conclusions should be viewed in context of some limitations regarding the limited number of patients in each drug treated groups, the heterogeneity of antipsychotic treatment and the convenience sampling. We tried to overcome these limitations by the appropriate statistical tools as much as we can. So, our results and conclusions should be considered in this context.

Acknowledgement

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References

1. Newcomer JW. Medical risk in patients with bipolar disorder and schizophrenia. The Journal of clinical psychiatry. 2006; 67: 25-30.
2. Colton CW, Manderscheid RW. Congruencies in increased mortality rates, years of potential life lost, and causes of death among public mental health clients in eight states. Preventing chronic disease. 2006; 3: 42.
3. Collins PY, Varma VK, Wig NN, Mojtabai R, Day R, Susser E. Fever and acute brief psychosis in urban and rural settings in north India. Br J Psychiatry. 1999; 174: 520-524.
4. Mojtabai R, Varma VK, Malhotra S, Mattoo SK, Misra AK, Wig NN, et al. Mortality and long-term course in schizophrenia with a poor 2-year course: a study in a developing country. Br J Psychiatry: the journal of mental science. 2001; 178: 71-75.
5. Casey DE, Haupt DW, Newcomer JW, Henderson DC, Sernyak MJ, Davidson M, et al. Antipsychotic-induced weight gain and metabolic abnormalities: implications for increased mortality in patients with schizophrenia. J Clin Psychiatry. 2004; 65: 4-18.
6. Bushe C, Holt R. Prevalence of diabetes and impaired glucose tolerance in patients with schizophrenia. Br J Psychiatry Suppl. 2004; 47: 67-71.
7. Buchsbaum MS, Buchsbaum BR, Hazlett EA, Haznedar MM, Newmark R, Tang CY, et al. Relative glucose metabolic rate higher in white matter in patients with schizophrenia. Am J Psychiatry. 2007; 164: 1072-1081.
8. Newcomer JW, Hennekens CH. Severe mental illness and risk of cardiovascular disease. Jama. 2007; 298: 1794-1796.
9. Saha S, Chant D, McGrath J. A systematic review of mortality in schizophrenia: is the differential mortality gap worsening over time? Archives of general psychiatry. 2007; 64: 1123-1131.
10. Gray DS. Diagnosis and prevalence of obesity. Med Clin North Am. 1989; 73: 1-13.
11. Berrington de Gonzalez A, Hartge P, Cerhan JR, Flint AJ, Hannan L, MacInnis RJ, et al. Body-mass index and mortality among 1.46 million white adults. The New England journal of medicine. 2010; 363: 2211-2219.
12. Banerji MA, Lebowitz J, Chaiken RL, Gordon D, Kral JG, Lebovitz HE. Relationship of visceral adipose tissue and glucose disposal is independent of sex in black NIDDM subjects. The American journal of physiology. 1997; 273: 425-32.
13. Thakore JH, Mann JN, Vlahos I, Martin A, Reznek R. Increased visceral fat distribution in drug-naive and drug-free patients with schizophrenia. International journal of obesity and related metabolic disorders: journal of the International Association for the Study of Obesity. 2002; 26: 137-141.
14. Srisurapanont M, Likhitsathian S, Boonyanaruthee V, Charnsilp C, Jarusuraisin N. Metabolic syndrome in Thai schizophrenic patients: a naturalistic one-year follow-up study. BMC psychiatry. 2007; 7: 14.
15. Hasnain M. Schizophrenia and metabolic dysregulation: shared roots? The lancet Psychiatry. 2016; 3: 10031005.
16. Said MA, Hatim A, Habil MH, Zafidah W, Haslina MY, Badiah Y, et al. Metabolic syndrome and antipsychotic monotherapy treatment among schizophrenia patients in Malaysia. Preventive medicine. 2013; 57: 50-53.
17. Softic R, Sutovic A, Avdibegovic E, Osmanovic E, Becirovic E, Hajdukov MM. Metabolic syndrome in schizophrenia - who is more to blame: FGA polypharmacy or clozapine monotherapy? Psychiatria Danub. 2015; 27: 378-384.
18. Tirupati S, Chua LE. Obesity and metabolic syndrome in a psychiatric rehabilitation service. The Australian and New Zealand journal of psychiatry. 2007; 41: 606-610.
19. Koller E, Schneider B, Bennett K, Dubitsky G. Clozapine-associated diabetes. The American journal of medicine. 2001; 111: 716-723.
20. Koller EA, Doraiswamy PM. Olanzapine-associated diabetes mellitus. Pharmacotherapy. 2002; 22: 841-845
21. American Diabetes A, American Psychiatric A, American Association of Clinical E, North American Association for the Study of Consensus development conference on antipsychotic drugs and obesity and diabetes. The Journal of clinical psychiatry. 2004; 65: 267-272.
22. Haupt DW, Newcomer JW. Hyperglycemia and antipsychotic medications. The Journal of clinical psychiatry. 2001; 62: 15-26.
23. Kropp S, Grohmann R, Hauser U, Ruther E, Degner D. Hyperglycemia associated with antipsychotic treatment +in a multicenter drug safety project. Pharmacopsychiatry. 2004; 37: 79-83.
24. Gouveia C, Chowdhury TA. Diabetes, schizophrenia and metabolic effects of antipsychotic drugs. Mental health today. 2013: 24-27.
25. Newcomer JW, Haupt DW, Fucetola R, Melson AK, Schweiger JA, Cooper BP, et al. Abnormalities in glucose regulation during antipsychotic treatment of schizophrenia. Archives of general psychiatry. 2002; 59: 337-345.
26. Henderson DC, Cagliero E, Copeland PM, Borba CP, Evins E, Hayden D, et al. Glucose metabolism in patients with schizophrenia treated with atypical antipsychotic agents: a frequently sampled intravenous glucose tolerance test and minimal model analysis. Arch Gen Psychiatry. 2005; 62: 19-28.
27. Kane JM. Clinical efficacy of clozapine in treatment-refractory schizophrenia: an overview. Br J Psychiatry Suppl. 1992: 41-45.
28. Meltzer HY, Alphs LD, Bastani B, Ramirez LF, Kwon K. Clinical efficacy of clozapine in the treatment of schizophrenia. Pharmacopsychiatry. 1991; 24: 44-45.
29. Eskelinen S, Sailas E, Joutsenniemi K, Holi M, Suvisaari J. Clozapine use and sedentary lifestyle as determinants of metabolic syndrome in outpatients with schizophrenia. Nord J Psychiatry. 2015; 69: 339-345.
30. McEvoy JP, Freudenreich O. Review: clozapine shows some improved clinical efficacy over risperidone and zotepine in treatment of schizophrenia, but robust evidence is lacking. Evid Based Ment Health. 2011; 14: 53.
31. Fleischhacker WW, Heikkinen ME, Olie JP, Landsberg W, Dewaele P, McQuade RD, et al. Effects of adjunctive treatment with aripiprazole on body weight and clinical efficacy in schizophrenia patients treated with clozapine: a randomized, double-blind, placebo-controlled trial. Int J Neuropsychopharmacol. 2010; 13: 1115-11125.
32. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E, et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): the development

and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. J Clin Psychiatry. 1998; 59: 22-33.

33. Kadri N, Agoub M, El Gnaoui S, Alami Kh M, Hergueta T, Moussaoui D. Moroccan colloquial Arabic version of the Mini International Neuropsychiatric Interview (MINI): qualitative and quantitative validation. Eur Psychiatry. 2005; 20: 193-195.

34. American Psychiatric A, American Psychiatric A, Task Force on D-I. Diagnostic and statistical manual of mental disorders : DSM-IV-TR. Washington, DC: American Psychiatric Association. 2000.

35. Lin CC, Yu SC, Wu BJ, Chang DJ. Measurement of waist circumference at different sites affects the detection of abdominal obesity and metabolic syndrome among psychiatric patients. Psychiatry Res. 2012; 197: 322-326.

36. Batki AD, Garvey K, Thomason HL, Holder R, Thorpe GH. Blood glucose measuring systems. Professional nurse. 1998; 13: 865-870.

37. Gordon GB. Saturated free fatty acid toxicity. II. Lipid accumulation, ultrastructural alterations, and toxicity in mammalian cells in culture. Exp Mol Pathol. 1977; 27: 262-276.

38. Wysokinski A, Strzelecki D, Kloszewska I. Levels of triglycerides, cholesterol, LDL, HDL and glucose in patients with schizophrenia, unipolar depression and bipolar disorder. Diabetes Metab Syndr. 2015; 9: 168-176.

39. Saari KM, Lindeman SM, Viilo KM, Isohanni MK, Jarvelin MR, Lauren LH, et al. A 4-fold risk of metabolic syndrome in patients with schizophrenia: the Northern Finland 1966 Birth Cohort study. J Clin Psychiatry. 2005; 66: 559-563.

40. Chua LE, Tirupati S. Obesity and metabolic syndrome in a psychiatric rehabilitation service. Aust N Z J Psychiatry. 2007; 41: 606-610.

41. Brunero S, Lamont S. Health behaviour beliefs and physical health risk factors for cardiovascular disease in an outpatient sample of consumers with a severe mental illness: a cross-sectional survey. Int J Nurs Stud. 2010; 47: 753-760.

42. Yogaratnam J, Biswas N, Vadivel R, Jacob R. Metabolic complications of schizophrenia and antipsychotic medications--an updated review. East Asian Arch Psychiatry. 2013; 23: 21-28.

43. Dobrzanski T. [In vitro study on utilization of glucose in adipose tissue of patients with diabetes mellitus and schizophrenia]. Endokrynologia Polska. 1970; 21: 65-74.

44. Schultz SK, Arndt S, Ho BC, Oliver SE, Andreasen NC. Impaired glucose tolerance and abnormal movements in patients with schizophrenia. Am J Psychiatry. 1999; 156: 640-642.

45. Elias AN, Hofflich H. Abnormalities in glucose metabolism in patients with schizophrenia treated with atypical antipsychotic medications. Am J Med. 2008; 121: 98-104.

46. Bajaj S, Varma A, Srivastava A, Verma AK. Association of metabolic syndrome with schizophrenia. Indian J Endocrinol Metab. 2013; 17: 890-895.

47. Ryan MC, Collins P, Thakore JH. Impaired fasting glucose tolerance in first-episode, drug-naive patients with schizophrenia. Am J Psychiatry. 2003; 160: 284-289.

48. Lindenmayer JP, Czobor P, Volavka J, Citrome L, Sheitman B, McEvoy JP, et al. Changes in glucose and cholesterol levels in patients with schizophrenia treated with typical or atypical antipsychotics. Am J Psychiatry. 2003; 160: 290-296.

49. Baymiller SP, Ball P, McMahon RP, Buchanan RW. Serum glucose and lipid changes during the course of clozapine treatment: the effect of concurrent beta-adrenergic antagonist treatment. Schizophr Res. 2003; 59: 49-57.

50. Bou Khalil R. Atypical antipsychotic drugs, schizophrenia, and metabolic syndrome in non-Euro-American societies. Clin Neuropharmacol. 2012; 35: 141-147.

51. Nagamine T. Olanzapine-induced elevation of serum triglyceride levels in a normal weight patient with schizophrenia. Intern Med. 2008; 47: 181-182.

52. Kaushal J, Bhutani G, Gupta R. Comparison of fasting blood sugar and serum lipid profile changes after treatment with atypical antipsychotics olanzapine and risperidone. Singapore Med J. 2012; 53: 488-492.

53. Baldessarini RJ, Frankenburg FR. Clozapine. A novel antipsychotic agent. N Engl J Med. 1991; 324: 746-754.

54. Karakas Ugurlu G, Ulusoy Kaymak S, Ugurlu M, Orsel S, Caykoylu A. Total white blood cell count, liver enzymes, and metabolic syndrome in schizophrenia. Turk J Med Sci. 2016; 46: 259-264.

55. Bai YM, Chen JY, Yang WS, Chi YC, Liou YJ, Lin CC, et al. Adiponectin as a potential biomarker for the metabolic syndrome in Chinese patients taking clozapine for schizophrenia. J Clin Psychiatry. 2007; 68: 1834-1839.

56. Rout JK, Dasgupta A, Singh OP, Banerjee U, Das B. Anthropometric parameters as indicators of metabolic derangements in schizophrenia patients stabilized on olanzapine in an Indian rural population. J Neurosci Rural Pract. 2012; 3: 277-282.

57. Citrome L, Holt RI, Walker DJ, Hoffmann VP. Weight gain and changes in metabolic variables following olanzapine treatment in schizophrenia and bipolar disorder. Clin Drug Investig. 2011; 31: 455-482.

58. Kim SH, Kim K, Kwak MH, Kim HJ, Kim HS, Han KH. The contribution of abdominal obesity and dyslipidemia to metabolic syndrome in psychiatric patients. Korean J Intern Med. 2010; 25: 168-173.

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