

DRUG ADDICTION – EPIDEMIOLOGICAL CORRELATIONS

Claudiu G. DĂNILĂ¹, Roxana CHIRIȚĂ², Marius TURNEA³,
Romeo Petru DOBRIN⁴, Vasile CHIRIȚĂ⁵

Abstract:

Medical practice, brings us face to face with some situations where the patient has certain disorders of behaviour, or other organic manifestations due to abuse of psychoactive substances (7). Behind these patients, victims of a reprehensible social phenomenon, is an industry full of unimaginable proportions for some people. In the context of the current direction that it goes global human society, although not a new item, approach of this phenomenon is an obligation rather than a necessity. The existence of such a phenomenon in a community, how it is addressed, the solutions to eradicate, prevention and treatment method are real objective indices of human quality, indices that actually play an important role in the socio-cultural status and economic implication of that community. The importance of this issue is given directly by its content, the complexity of actions and solutions needed to solve such problems is given by the gravity of the phenomenon itself.

Key words: drug addiction, typology, evolution

INTRODUCTION

Experience from different countries showed over the years and in different socio-cultural circumstances, clear link between social attitudes and the use of some substances. The way in how science has revolutionized the understanding of drug addictions appears clear in a brief retrospective analysis. In the early studies of addictive behaviour, by 1930, drug addicted patients, like also specifically psychiatric patients, they wore a stigma among society, considered to be morally altered and with lack of will. As a result of scientific research, today we know that drug addiction is a disease that directly affects the brain, thereby affecting the human behaviour (14). Thus, there were identified many biological and environmental factors and there are at the

¹ M.D., Drd, University of Medicine and Pharmacy “Gr. T. Popa” Iași; Resident in psychiatry, Clinical Psychiatric Hospital “Socola” Iași

² M.D., Ph.D., Senior Psychiatrist, Professor, University of Medicine and Pharmacy “Gr.T. Popa” Iași, Dept. of Psychiatry, University Hospital of Psychiatry “Socola” Iași

³ Assistant Professor University of Medicine and Pharmacy “Gr. T. Popa” Iași, Dept. of Bioengineering

⁴ M.D., Ph.D., Assistant Professor University of Medicine and Pharmacy “Gr. T. Popa”, Dept. of Psychiatry, Psychiatrist, Clinical Hospital of Psychiatry “Socola” Iași

⁵ M.D., Ph.D., Senior psychiatrist, Professor, University of Medicine and Pharmacy “Gr. T. Popa” Iași; Senior Psychiatrist, Clinical Hospital of Psychiatry “Socola” Iași; Member of Romanian Academy of Medical Science

beginning the researches on genetic variations, factors that are contributing to the development and the progression of the disease.

Psychoactive substance use and addiction in our country involve some special features. Identification of these special features in a more active and more specifically way, is a goal to be attained in our desire to provide professional healthcare services, and not only, reliable to typology as seen in our clinics.

Many studies have shown that the relapse rates among the drug addicted patients are comparable, in some cases even lower, with the relapse rates in patients suffering from other chronic diseases (14).

Taking care of these issues, we have identified in this phenomenon, the drug addiction, a very well defined epidemiological characteristic.

MATERIAL AND METHOD

Analyzing the results of an epidemiological study conducted in the U.S. in 2000, study that has shown the relapse rates among the drug addicted patients comparable with the relapse rates in patients suffering from other chronic diseases, we have identified in this phenomenon, the drug addiction, a very well defined epidemiological characteristic. The results of that study has shown that the relapse rates among the drug addiction patients are comparable, in some cases even lower, with the relapse rates in patients suffering from hypertension, diabetes and asthma. Our analysis was based on a group of 98 patients who required specialized care for disorders related to excessive use of drugs, in the Psychiatric University Hospital "Socola" Iași. The evaluation was performed by filling the tridimensional bio-psycho-social assessment file, the aim being in determining the drug users profile, which eventually reaches at a specializes clinic, and in finding some constants of this profile.

Using these constants derived from the drug users profile, using methods of mathematical projection, we realized the prognosis of evolution, from the epidemiologically point of view, of drug addiction phenomenon in a real population database.

STATISTICAL APPROACHES

In the statistical analysis were used both descriptive and the analytical methods.

After data collection in an accessible form, to ensure their information character, the processing of data was made.

Actions of the processing included the stage of order, systematize, and reduce the volume of gathered information, by successive operations of grouping, sorting, coding and synthesis. The data were expressed in a form allowing their classification in certain categories. A variable will not be recorded in many forms. Data grouping will be made by the certain categories of variables. The data were centralized in EXCEL and SPSS databases and processed with statistical functions to which they lend.

In presenting data were used confidence intervals to 95% materiality, and to test differences were used χ^2 and t-Student tests.

Primary processing, namely the systematization of data by centralization and grouping, led to obtaining primary indicators, which are presented as absolute magnitude. Based on the primary indicators, by different statistical methods of comparing, abstraction and generalization, derived indicators were obtained.

RESULTS

Drug addiction chronic aspect implies that relapses are not only possible, but rather probable, such as relapses rates of other chronic medical conditions such as diabetes, hypertension and asthma, clinical conditions which involve both physiological and behavioural changes. The treatment of chronic diseases involves deep changes and behavioural adaptations, and relapse does not mean treatment failure. In drug addicted patients, the abuse resumed indicates that treatment should be reassessed, adjusted or that required additional treatment alternatives (14).

In Figure 1, are highlighted in comparative terms the rates of drug addicts relapse rates with relapse rates in patients suffering from hypertension, diabetes or asthma (12).

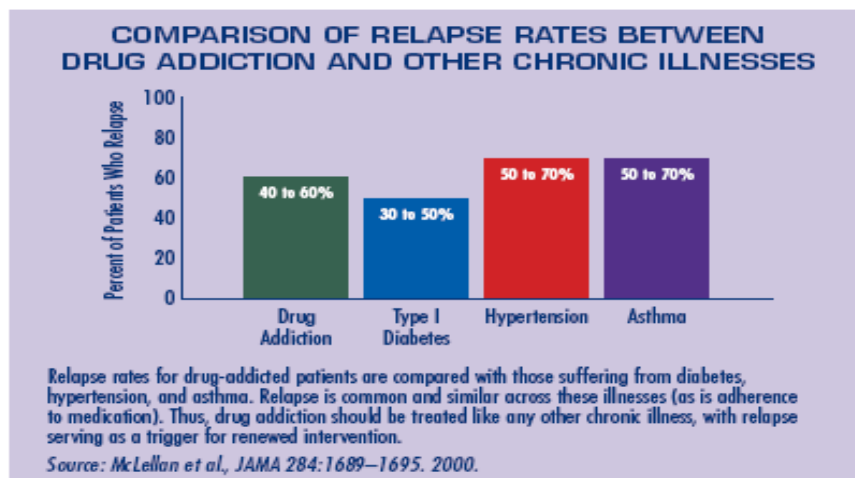


Fig. 1. Comparison of relapse rates among drug addicts with relapsing rates of other chronic diseases

Researches shows that drug treatment, psychopharmacology, combined with behavioural therapies, where possible, are the best ways to ensure the success of treatment for most patients. Also, the therapeutic management must be adapted, taking into account the medical, psychiatric and even patient-specific social evidence.

The study group was consisted of 98 patients, 10 women and 88 men in the ratio F / M = 1 / 9. As is shown in Figure 2, the gender distribution was in favour of males (89.8%).

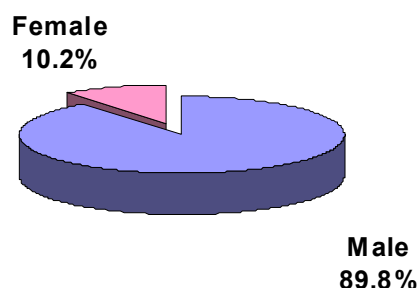


Fig. 2. Distribution of patients by gender

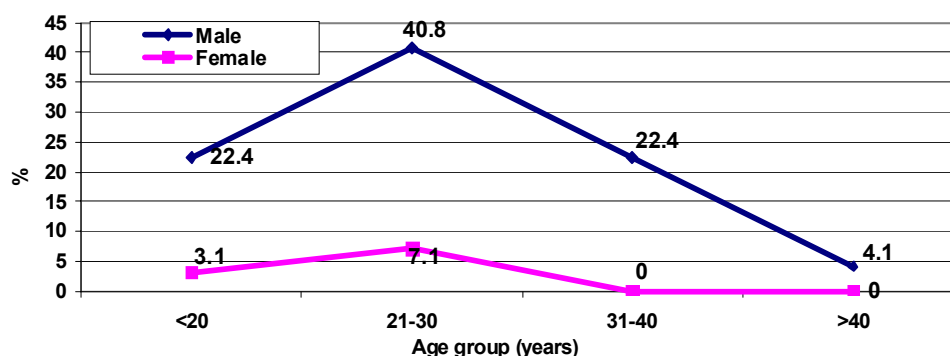
Age distribution was determined on first admissions, and is as: the average age of patients entering into the study was 26.06 ± 6.86 years, ranging between 18 and 41 years, who was significantly higher compared with the average age at onset of drug use, which was 19.0 ± 3.50 years (t -Student=9,09; GL=194; $p < 0.001$).

The same significant difference is observed by applying the ANOVA test ($p < 0.001$), with variances approximately equal of the values series for age and length of drug consumption, according to Table I.

Table. I. Statistical significance of ANOVA test

Anova: Single Factor						
SUMMARY						
Groups	Count	Sum	Average	Variance		
age	98	2554	26.06122	47.089		
experienced drug	98	667	6.806122	43.7146		
ANOVA						
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	18167.19	1	18167.19	400.1425	4.91619E-49	3.889837785
Within Groups	8807.949	194	45.4018			
Total	26975.14	195				

By age and sex, the module is found in women in age group 21 – 30 years (7.1%) and in males also the same age group (40.8%).

**Fig. 3. Distribution by age and sex of patients in the study group**

Overall group, there is an increased distribution of cases within the age group 21 – 30 years (48%), followed by age groups below 20 years (25.5%) and 31 – 40 years (22.4%). Note that there were only four cases (4.1%) aged over 40 years.

Female patients age ranged from 18 – 30 years with an average of 22.70 years, significantly lower than that in males who was 26.44 years, varying from 18 to 41 years.

Table II. Group structure by sex and age

Group age (years)	Female		Male		Total	
	n	%	N	%	n	%
≤ 20	3	3,1	22	22,4	25	25,5
21-30	7	7,1	40	40,8	47	48,0
31-40	-	-	22	22,4	22	22,4
> 40	-	-	4	4,1	4	4,1
Total	10	10,2	88	89,8	98	100
$\bar{X} \pm \sigma$	22,70±4,27		26,44±7,01			
statistical significance	t-Student = 2,42; GL = 96: p<0.05					

Limiting us at the epidemiological summary of results, concluding from statistical processing of the epidemiological characteristics, emerged outlining drug profile as Figure 4:

Table III. Drug user profile

Epidemiological feature	Profile	%
Sex	Male	89,9
Age group	≤ 25 years	58,2
Marital status	Unmarried	71,4
Religion	Orthodox	93,9
Studies	8-9 classes, vocational school	81,6
Qualification	Unqualified	65,3
Occupation	Unoccupied	61,2
Sexual orientation	Heterosexual	98,0
Hobby	No hobby	93,9

Distribution by age groups, as determined on assessment, that the average age of patients entering into the study was 26.06 ± 6.86 years, ranging between 18 and 41 years, being significantly higher compared with the average age at onset of drug use, which was 19.0 ± 3.50 years (t -student = 9.09, GL = 194, $p < 0.001$).

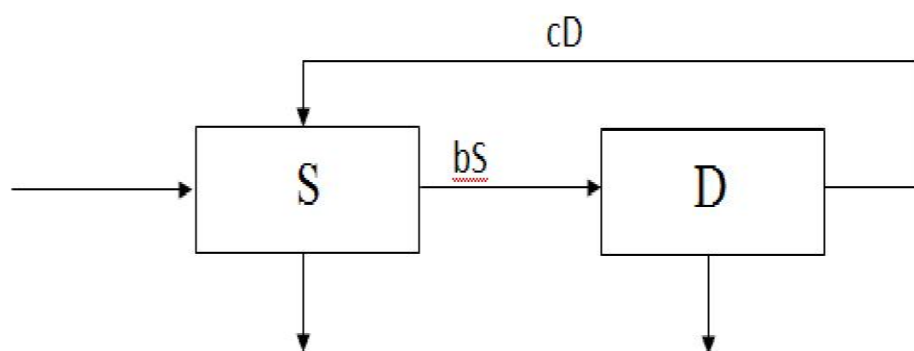
Moreover, initiation of drug use was determined in 100% by the entourage, which represents the negative induction by group.

These two aspects, the average age of onset of consumption at 19 years and initiating of consumption by 100% negative induction group are in mathematical terms, constants, elements which were the basis for achieving predictive mathematical models of epidemiological behaviour among drug users.

Finding a suitable model for drug addiction phenomenon is a difficult operation and represents a compromise between simplicity, accuracy and generality. We need a model which may approximate what happens in the real world, but also which may provide greater accuracy in order to be easily parameterized, resolved and implemented.

We initially propose a simple model, clients who are likely to become drug abusers are becoming drug users and then become susceptible again after recovery. The model is an endemic one, because the consumption of psychoactive substances still persist.

In psychiatric practice, a client that has a tendency to develop addictive behaviour, is a member of a population, which is exposed to a risk at the emergence of a drug abuser in the population of which he is part of. Structural diagram of such a model can be depicted as Figure 5:

**Fig. 5. Susceptible → Drug addicts → Susceptible**

This model, SDS, with the vital dynamic, (are involved departures from consumer group) is characterized by the following system of differential equations:

$$(1) \begin{cases} \frac{dS}{dt} = aN - aS - \frac{bDS}{N} + cD \\ \frac{dD}{dt} = \frac{bDS}{N} - cD - aD \end{cases}$$

cu condițiile inițiale:

$$(2) \begin{cases} S(0) = S_0 > 0 \\ D(0) = D_0 > 0 \\ S(t) + D(t) = N \end{cases}$$

Where:

N = total number of the group (which we consider fixed)

aN – join group rate

aS, aD – departure rate group

bS – passing from one compartment to another

Thus, a theoretical projection of this model, at a population of 500 clients over a period of 60 days, evolution could be next, depicted in Figure 6:

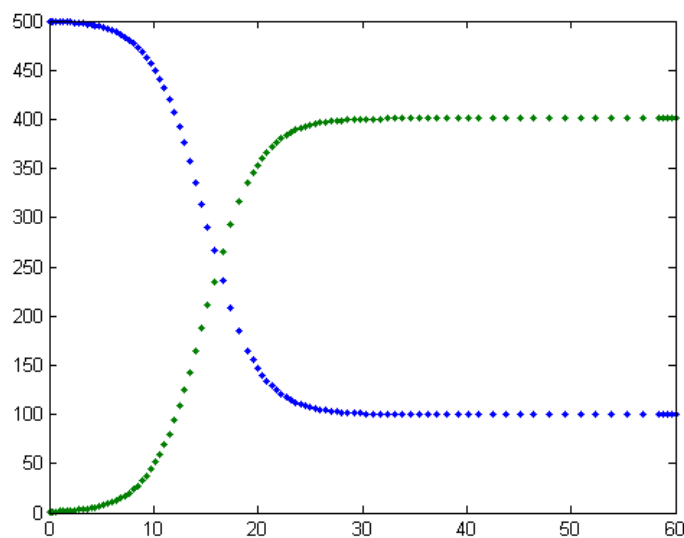


Fig. 6. Evolution of susceptibility (green) and drug users (blue)

The solution of that model complies with the assumption $s + d = 1$ and all trajectories passing through point $(s, d) = (1/g, 1 - 1/g)$, when $R_0 = g > 1$ and through point $(s, d) = (1, 0)$, when $R_0 = g \leq 1$.

Thus, if:

- $c \rightarrow 0$ system becomes type S-D model (susceptible-drug users), for $c, a \rightarrow 0$, the number of contacts $y = b/(c + a) = \infty$ and thus all individuals in the group will use drugs;

- The number R_0 is defined as the average number of persons who became drug users, within the fully susceptible group, as a result of contact with the initial consumers;

- Number of contacts d is defined as the average number of contacts who become drug users as a result of contact with a drug user;

- Thus, the R_0 is higher, the induction of drug abuse is stronger;

Practical application of the model proposed by us consists in the evolution of the phenomenon in a group of 150 people who attend a famous club in Iasi University Center. The data collected by us on the spot, suggesting an average number of 15 drug users.

Thus, we considered a number of contacts $b = 5$ per time unit and an induction period, similar to infectious period, $1/c = 3$ days (a weekend). Initial number of susceptible individuals $S(0) = 150$ and initial number of consumers are $D(0) = 15$. Given a fixed population $N = 165$ is observed that the number of susceptible individuals decreases with the increasing consumer number so that in about five weeks, the number of consumers and the number of susceptible individuals has the same value $S = D \cong 87$. The hope to leave the group has an average value $1/\alpha = 75$, and the rate of inputs and outputs of group $\alpha = 0,013$.

Figure 7 graphically reflects the possible development of the phenomenon within this group, using the mathematical model proposed by us:

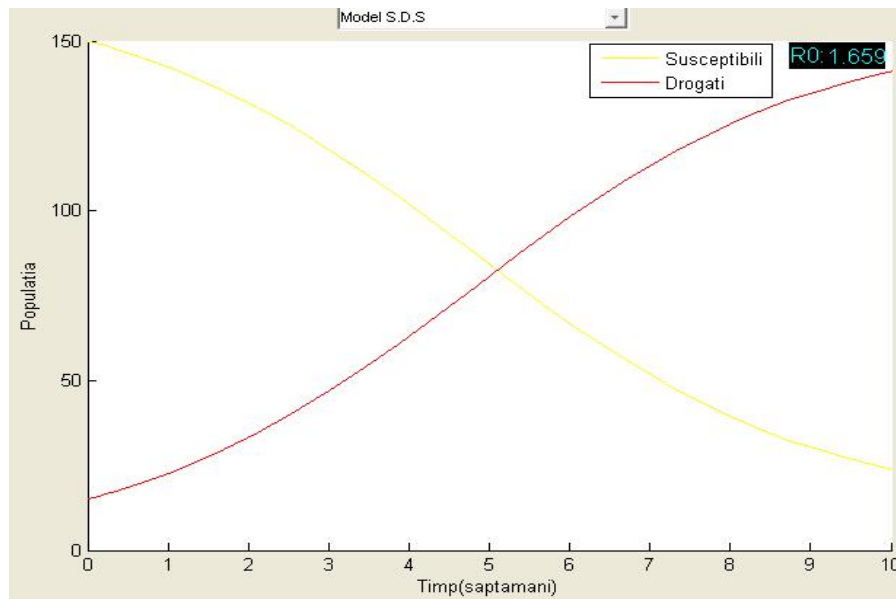


Fig 7. Simulation of S.D.S. model for $b=5$ and $\frac{1}{c} = 3$

DISCUSSIONS

This paper assesses some of the epidemiological characteristics of a chronic disease, namely consumption and drug addiction, identifying among these characteristics some constants related to consumer profile and proposes for implementation, taking account of these constants, a mathematical model for assessing changes of this phenomenon in a population group.

Evaluation of the epidemiological correlation of drug users, which we can say with certainty that it can raise to the level of a social phenomenon, effectively complements what we might call the therapeutic strategies in drug addiction, as an indication of the developments of this phenomenon among a population group and by highlighting the places where we could act, with specialists and multidisciplinary teams, to reduce or even to stop the time evolution of this phenomenon.

One advantage of mathematical modelling applied to consumption and drug addiction phenomenon is the economy, clarity and precision of the mathematical formulation. Of course, the parameters must be defined precisely and each term of the equation must be explained in terms of mechanism, but the result model is a clear expression of the basic principles involved. Once the mathematical formulation is complete, there are several mathematical techniques for determining the limits, equilibrium, periodic solutions and their global stability. More information about the model can be obtained by numerical simulations of equations. Mathematical analysis and computer simulations can identify important combinations of parameters and key issues or variables of that model. In order to choose and effectively use an epidemiological model for a specific disease we must understand the behaviour of the individual formulations available.

Currently, the only data available are from consumer groups already found or from the endemic incidence. Unfortunately, these data are not complete because many cases are not reported.

Since often there are no clear evidences, computer simulations must be used to develop theories using different experimental parameter values.

More important in this regard is that if the phenomenon, and its epidemiological behaviour is not controlled, it will go on indefinitely.

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