

Barbiturates and suicide: 60 years of casework in a northern Italy province

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Introduction

Barbiturates are central nervous system depressants belonging to the sedative-hypnotic classification. Their common basic chemical derivatives come from barbituric acid (C₄H₄N₂O₃).

More than 20 barbituric acid derivatives exist, and their main differences are sedative/hypnotic action at a standard dose, the time needed to produce clinical effects, and the duration of the effects. Other clinical uses are antiepileptic, in the treatment of hemiparesis, in the induction of anesthesia and in selected cases of cerebral edema. Suicide by barbiturates overdose has been reported in the scientific literature since the 1950s.

Materials and Methods

We examined the 31 cases of suicide by barbiturates overdose recorded in the file archive of the forensic/medicolegal section of the university hospital of Parma, Italy, between 1954 and 2014. We considered the following variables as relevant: time of death, sex of the deceased individual, age at death, the barbiturate derivative used, how barbiturates were acquired, how the dose was determined and the chosen analytical technique.

Time of death	Sex	Age at death	Medication/substance	Procurement/Administration route	Dose	Toxicology assessment
Dec-54	M	35	Sonno Lepetit	?	?	?
19/10/64	M	76	?	?	?	?
6/8/66	M	47	?	?	?	?
09/1966	M	29	Luminal	Paramedic	?	?
23/4/67	M	24	Pronox	Medicine School student (IV year, oral administration)	?	?
20/7/67	M	31	Nembutal and alcohol	?	?	Immunological assay
26/11/68	F	22	Letargin	Oral	15 tablets	Case history
10/12/68	M	19	Pentobarbitone	Oral	?	?
7/9/69	F	32	Pentobarbitone	Oral	?	?
21/12/70	M	46	?	?	?	?
29/8/71	M	26	Amital, Summontil	Medicine School student	?	Case history
3/10/71	F	37	?	?	5 boxes	Case history
14/1/72	M	32	?	?	?	?
16/9/73	F	51	?	?	?	?
21/1/75	F	20	Optalidon, Transene, Mogadon	?	4 boxes of Optalidon, 1 box of Mogadon, 1 box of Transene	Case history
18/3/75	F	35	?	?	?	?
27/6/75	M	29	?	?	?	?
3/8/75	M	?	Prominal	?	1 box	Case history
29/1/76	F	66	Barbitone, Pentobarbitone, Optalidon, Mefobarbital	?	?	Gas chromatographic on liver, stomach content, kidney
14/6/76	F	47	?	?	?	?
30/7/76	M	29	?	Oral	?	Case history
31/12/76	F	56	?	?	?	?
17/11/79	M	36	Phenobarbitone (Luminal) and alcohol	?	8,6mg% Phenobarbitone, 0,90g% alcohol	Thin-Layer Chromatography on blood and urine, confirmed by colorimetric titration
20/1/82	M	57	Phenobarbitone	Oral administration, institutionalised patient	11mg/ml (brain)	Direct extraction with ethyl ether on liver, brain, kidney, blood and urine and qualitative confirmation on brain by gas chromatography
22/6/82	M	25	Phenobarbitone, alcohol and Ajmalina	20 tablets of Ritmosedina prescribed the day before by the GP	Phenobarbitone: 5,20 µl (blood), 4,18 µl (urine); Ajmalina: 9,5mg% urine; alcohol: 1,8g% blood	Thin-Layer Chromatography on kidney, brain, stomach content, liver, fat tissue, blood and urine, confirmed by qualitative immunoenzymatic assay
31/8/83	F	28	Barbitone	Oral	16mg/100g kidney, 36mg/100g stomach content	Thin-Layer Chromatography and confirmation by Gas chromatography on brain, kidney, stomach content, liver and blood
17/7/86	M	60	Barbitone	?	13,7mg/ml blood, 72mg/ml liver	Patient in hemodialysis for chronic renal failure
20/9/96	F	34	Phenobarbitone	?	14,47 µg/ml blood, 13,69 µg/ml urine, 5,57 µg/ml bile, 231,71 µg/g stomach content	Gas chromatography on blood, urine, bile and stomach content
14/2/02	F	42	Phenobarbitone, Lometazepam, Fluvoxamine	?	1,74mg% blood, 2,82 mg% urine, 3,28mg% stomach content of Phenobarbitone	?
17/9/03	M	58	Phenobarbital, anti-hypertensive, alcohol	?	19,7 µg/ml	Immunochemical assay on urine confirmed by gas chromatography on blood
6/12/13	M	29	Pentobarbital	illegal market	35,2 µg/g brain	GC-MS (alcohol), Conway cell microdiffusion (HbCO), EMIT and LC/MS-MS (drugs screening), GC/MS (confirmation)

Results

The **total number of cases** was 31 in a population increasing from 390.000 to 450.000 in sixty years (1954-2014). The **peak number of cases** was between 1964 and 1976.

The **male/female ratio** was 1.58/1, with 19 M and 12 F. **Age at death** was comprised between 19 and 76 years, with a median age of 37,6 years.

Based on external examinations and autopsy reports, as well as case histories and newspapers articles, all 31 deaths were ruled as **suicides**. **Derivatives** such as butalbital and pentobarbital (short duration of action), amobarbital (intermediate duration), phenobarbital, barbital and mefobarbital (long duration) were used, sometimes in association with other drugs and/or alcohol.

The **analytical techniques** on biological matrixes gradually developed from immunoassays to GC/MS, through Thin-Layer GC.

Literature data were confirmed with regards to the **lethal dose** being ten times the therapeutic dose. Specifically, blood concentrations of 0,5-2 µg/ml for barbiturates with ultra-short duration of action, 1-5 µg/ml intermediate duration and 5-15 µg/ml long duration are confirmed as lethal.

Conclusions

- Our results were mostly consistent with the extensive literature about suicide by barbiturates overdose. Historically a rare occurrence, it has become rarer and rarer in the last 35 years, with the progressive substitution of benzodiazepines in medical prescriptions for anxiety and sleep disturbances. Benzodiazepines hold a higher Therapeutic Index and their use is, therefore, much safer.
- Surprisingly, male deceased were more numerous than female. This might be explained by males having, in the past, more occasions to acquire the drugs, for example through employment (doctors, paramedics, orderlies) or study (Medicine School students). Interestingly, no barbiturates with ultra-short duration of action were involved, probably because their limited hospital use in anesthesia induction made them practically inaccessible.
- In a socio-cultural context, we noticed how evidence in the past relied much more on case histories than on science, that is police reports and newspapers articles vs. toxicology. Similarly to the evolution of requirements connected to evidence, toxicology has evolved, both through the technology of analytical methods and in the procedural guidelines, such as the current necessity of two distinct techniques, based on different analytical principles, for screening and confirmation (e.g. EMIT and GC/MS).
- Finally, before the decline of medical prescriptions 35 years ago, aspiring suicides acquired barbiturates by prescription or by seizing them in sanitary institutions, such as hospitals or emergency rooms. Dissimilarly, the 2000s witnessed the rise of the illegal market, either physical or, more commonly, online through the dark web.

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