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Flemming Bro & Carl Erik Mabeck

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Use of Antibiotics in General Practice in Denmark

Prescribed Daily Dose, Duration of Treatment and Number of Treatments in General Practice

FLEMMING BRO and CARL ERIK MABECK

Institute of General Practice, University of Aarhus, Denmark

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Prescribed daily dose (PDD) and duration of treatment is estimated for the most commonly used antibiotics in a multipractice study. In 1979 574 general practitioners and in 1983 625 general practitioners recorded 7 681 respectively 8 182 prescriptions of antibiotics over a five-day period. PDD and the number of treatments were compaired with Defined Daily Dose (DDD) and DDD/1 000 inhabitants/day from the official statistics of drug consumption. It was found that these commonly used units were rather misleading with regard to the daily dose actually prescribed and the number of treatments given in a certain period.

Key words: prescribed daily dose, defined daily dose, general practice, antibiotics, multipractice study.

C. E. Mabeck, MD, Institute of General Practice, Finsensgade 10, DK-8000, Aarhus C, Denmark.

The Nordic Council on Medicines recommends the defined daily dose (DDD) as a unit of measurement for comparative drug consumption statistics (1,2). DDD is based on the assumed average daily dose used for the main indication of the drug. The consumption is expressed as the number of DDD's per 1 000 inhabitants per day. This indicates directly how many persons out of 1 000 that may daily receive a "standard" treatment. By using DDD as a unit of measurement, an improved basis for comparisons, independant of price differences, and different preparations has been achieved. Tracing drug consumption through longer periods of time, nationally and internationally, becomes easier and at the same time more correct by the use of defined daily doses.

However, therapeutic use and dosage may vary from country to country. Therefore DDD cannot give an exact estimate of the number of patients under treatment. Furthermore, estimate of the proportion of the population using a drug will be possible only with drugs used continuously, such as insulin or hormonal contraceptives. Since most drugs are used periodically, like antibiotics, it is necessary to have information about prescribed daily dose (PDD) and information of the average duration of treatment in order to estimate the number of patients treated.

DDD is accepted as a standard unit for statistical purposes in several countries in and outside Scandinavia. Demonstration of deviation of PDD from DDD in different countries cannot, therefore, imply revision of DDD. But knowledge about the ratio PDD:DDD makes adjustment of DDD for each country possible. Knowledge about the average duration of treatment makes it possible to calculate the number of people treated per year per 1 000 inhabitants. This is preferably compared with the number of DDD per 1 000 inhabitants per year especially for drugs not used continuously.

In the present study PDD and duration of treatment is estimated for the most commonly used antibiotics in general practice. The results are compared with the statistic on drugs consumption based on DDD and DDD per 1 000 inhabitants per year.

MATERIAL AND METHODS

In a multipractice study all general practitioners in five Danish counties were asked to register all prescriptions of antibacterial drugs during 19–23 March 1979. For each prescription information about diagnosis, drug prescribed, dosage, duration of treatment and the patient's age and sex were recorded. The study was repeated 21–25 March 1983.

Table I. *Antibiotics in general practice. PDD in grams and duration of treatment in days*

Drug prescribed	No. of prescriptions		PDD		Average duration of treatment	
	1979	1983	1979	1983	1979	1983
Phenoxymethyl-penicillin	2 778	2 689	1.78	1.95[a]	6.8	6.3
Azidocillin	376	294	1.50	1.51	7.9	7.5
Ampicillin	250	125	1.08	1.07	7.5	6.8
Amoxicillin	334	453	0.82	0.93	7.8	6.9
Pivampicillin	380	717	1.09	1.12	7.7	7.4
Pivmecillinam	57	99	0.70	0.87	8.2	5.7
Erythromycin	576	924	0.91	0.94	7.2	7.7
Tetracycline	532	374	0.82	0.71	9.2	10.0
Rapidly excreted sulphonamides	467	520	2.56	2.24	9.9	7.6
Sulphonamide/trimethoprim	399	376	3.90[b]	3.89[b]	7.7	7.4
Others	178	160				
Total	6 327	6 731			7.66	7.15

[a] Mio I.U. [b] No. of tablets.

In 1979 574 doctors (67% of general practitioners in the counties selected participated, compared with 625 (66%) in 1983. The total number of prescriptions registered was 7 681 in 1979 and 8 182 in 1983.

PDD is estimated as the average dose prescribed for each drug included. PDD varies with age until the age of 15 while PDD for adults is independent of age (3). DDD is compared with PDD_{15+}, i.e. the average prescribed dose for all patients of 15 years and above.

Information about DDD per 1 000 inhabitants per years was obtained from the Danish Board of Health (4). This is based upon information from all farmaceutical companies in Denmark about the total amount sold of each drug. The statistics published provide no information about the total amount sold, but about the DDD/1 000 inhabitants/day. The number of treatments per 1 000 inhabitants is therefore calculated from the formula:

$$\text{No. of treatments per 1 000 inhabitants per year} = \text{DDD/1000 inhabitants/day} \times \frac{365}{\text{Mean duration of treatment}} \times \frac{\text{DDD}}{\text{PDD}}.$$

Table II. *Antibiotics. PDD in grams in relation to patients age group in years*

Drug prescribed	Age group							
	15–24	25–34	35–44	45–54	55–64	65–74	75+	PDD 15+
Phenoxymethyl-penicillin[a]	2.2	2.3	2.4	2.3	2.4	2.5	2.3	2.3
Azidocillin	1.5	1.6	1.5	1.4	1.5	1.5	1.5	1.5
Ampicillin	1.3	1.4	1.4	1.6	1.4	1.6	1.6	1.4
Amoxicillin	1.2	1.3	1.3	1.4	1.3	1.4	1.4	1.3
Pivampicillin	1.2	1.3	1.2	1.2	1.2	1.2	1.2	1.2
Pivmecillinam	1.0	1.2	0.9	0.9	0.9	0.7	0.8	0.9
Erythromycin	0.9	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Tetracycline	0.6	0.7	0.6	0.7	0.8	0.8	0.8	0.7
Rapidly excreted sulphonamides	2.0	2.0	2.4	2.2	2.7	2.2	0.2	2.3
Sulphonamide/trimethoprim[b]	3.9	4.0	3.8	3.8	3.7	4.0	4.2	4.0

[a] Mio I.U. [b] No. of tablets.

Table III. *Antibiotics. PDD_{15+} and DDD in grams and difference between PDD and DDD*

Drug prescribed	No. of prescriptions	PDD_{15+}	DDD	$\frac{PDD-DDD}{PDD} \times 100\%$
Phenoxymethyl-penicillin	1 773	2.32[a]	3.0	−29
Azidocillin	284	1.52	1.5	+1
Ampicillin	66	1.43	2.0	−40
Amoxicillin	249	1.28	1.0	+22
Pivampicillin	592	1.23	1.05	+15
Pivmecillinam	93	0.89	0.6	+33
Erythromycin	749	0.99	1.0	−1
Tetracycline	369	0.71	1.0	−41
Rapidly excreted sulphonamides	492	2.26	4.0	−77
Sulphonamides/trimethoprim	333	4.0[b]	4.0[b]	0
Others	137	-	-	-
Total	5 145			

[a] Mio. I.U. [b] Number of tablets.

RESULTS

Table I comprises all patients and shows the PDD and mean duration of treatment for antibiotics and sulphonamides included in the study. The mean duration of treatment for all antibiotics was about seven days. Tetracycline makes an exception because tetracyclines in some cases are used in long-term treatments of skin diseases. For all penicillins and sulphonamides a trend towards shorter treatment period was found by comparing 1979 with 1983.

Table II shows that PDD_{15+} for all drugs included is independent of the patients age. Table III shows PDD_{15+} in relation to DDD. As PDD_{15+} only includes adults this is somewhat higher than PDD in Table I. For phenoxymethyl-penicillin, ampicillin, tetracycline and rapidly excreted sulphonamides DDD is considerably higher than PDD_{15+}. For amoxicillin, pivampicillin and pivmecillinam DDD is considerably lower than PDD_{15+}.

Table IV shows the relative number of persons treated in 1979 and in 1983 with each drug. The table shows that 201 treatments with phenoxymethyl-penicillin were prescribed per 1 000 inhabitants in 1983. The total number of treatments per 1 000 inhabitants increased from 505 to 583 over

Table IV. *Antibiotics. DDD/1 000 inhabitants/day and number of treatments/1 000 inhabitants/year*

	1979		1983	
Drug	DDD/1 000 inhabitants/day	No. of treatments/1 000 inhabitants/year	DDD/1 000 inhabitants/day	No. of treatments 1 000 inhabitants/year
Phenoxymethyl-penicillin	2.10	190	2.25	201
Azidocillin	0.34	16	0.22	11
Ampicillin	0.50	45	0.31	31
Amoxicillin	0.29	17	0.53	30
Pivampicillin	1.08	49	1.61	74
Pivmecillinam	0.16	6	0.24	11
Erythromycin	0.66	24	1.46	74
Tetracycline	1.64	79	1.27	65
Rapidly excreted sulphonamides	0.58	33	0.54	50
Sulphonamide/trimethoprim	0.95	46	0.70	36

this four-year period. This was mainly due to increase in use of broad-spectrum penicillins, erythromycin and rapidly excreted sulphonamides. Table IV shows that DDD/1 000 inhabitants/year is a rather misleading expression of the number of treatments prescribed.

DISCUSSION

Reliable statistic is essential in the monitoring of drug consumption. International accept of the Anatomical Therapeutic Chemical Classification Code (ATC-codes) and of DDD per day per 1 000 inhabitants as a unit for comparison of drug consumption implies great progress in drug statistic. DDD per 1 000 inhabitants per year makes it possible to follow the total amount of drug sold for instance over time and internationally. The expression is well suited for economic purposes.

For medical purposes the total number of treatments is of greater interest. Because of change in prescribing habits with regard to dose and duration of treatment, change in DDD per 1 000 inhabitants per day does not necessarily reflect change in number of patients treated. A more precise statistics implies knowledge about PDD and the mean duration of treatment for each drug.

In the present study PDD and mean duration of treatment were estimated in a clinical survey of use of antibiotics and sulphonamides. Information about the total amount sold of each antibiotics then makes it possible to estimate the total number of treatments. For comparison and practical reasons the official figures for DDD/1 000 inhabitants/day were used in this study instead of the total amount sold. Antibiotics included here are predominantly prescribed in general practice and we assume that prescriptions made by private specialists do not differ significantly from prescriptions in general practice with regard to PDD and mean duration of treatment.

Great deviations between DDD and PDD was found for most antibiotics. This implies, that PDD should be estimated empirically. Estimation of PDD must take place with short intervals, as PDD for antibiotics may change considerably over a few years. It was found that DDD/1 000 inhabitants/year is a rather misleading expression of the number of patients treated. However, as the duration of treatment for all antibiotics, with the exception of tetracycline, was rather constant about seven days the ratio

$$\frac{\text{DDD/1 000 inhabitants/day}}{\text{No. of treatments/1 000 inhabitants/year}} \times \frac{365}{7}$$

is close to PDD/DDD for antibiotics. PDD can be estimated from prescription studies (3, 5). In contrast to this, mean duration of treatment cannot, at lest in Denmark, be determined with sufficient accuracy from prescriptions.

It is recommended that PDD is estimated regularly from prescription studies. The mean duration of treatment for drugs used both for longer and shorter periods should be estimated in clinical studies. This is important in order to obtain a better statistics on the use of drugs for medical purposes.

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