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## ORIGINAL PAPER

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# MORBIDITY WITH TEMPORARY INCAPACITY AMONG EMPLOYEES ENGAGED IN ENGINEERING COMPANIES

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### SUMMARY

**Background:** Since 2002 an International Company for ball-bearing rings and metal rubber gaskets opened his plant production in Bulgaria. The aim of the present survey was to analyse the health status of employees in this industry.

**Materials and methods:** An analysis of morbidity with temporary inability to work was carried out in 2010 of 1334 employees. Source information concerning general disorders, employment accidents and occupational diseases has been collected from patients' charts with all other causes regulated by the Bulgarian legislation being excluded. Evaluation of morbidity has been made after Batkis-Lekarev classification.

**Results:** 807 patients have been registered with 1672 initial patient charts. The age structure shows highest relative share for patients up to 25 years of age – 82,14% at average continuance of 6.8 days/case and 14.2 days/person of all cases, at highest gravity for those above 55 years of age (frequency – 56,76%, average continuance – 15,8 days/case and 32,1 days/person). According to the nosological structure within the International Classification of Diseases (10th Revision), most frequently patient charts have been issued because of Diseases of the respiratory system – 34.05%, followed by Diseases of the musculoskeletal system and connective tissue – 15.43%, Certain infectious and parasitic diseases – 9.45%, Injuries – 9.39%, etc. The highest gravity is observed in Diseases of the musculoskeletal system and connective tissue – 22.92%.

**Conclusion:** Very high morbidity has been detected in respect to the following indicators: Frequency of morbidity cases per 100 employees and Frequency of day losses per 100 employees in accordance with Batkis-Lekarev classification.

**Key words:** Temporary incapacity, engineering, employees, nosological structure, disorders

### RÉSUMÉ

**Analyse ponctuelle de la morbidité des travailleurs d'une entreprise de construction mécanique**

En 2002 une compagnie internationale spécialisée à la fabrication et le commerce de roulements à billes, de bagues à roulements et de protecteurs métallo-plastiques a établi une filiale en Bulgarie. Le but de cette étude est de réaliser une analyse ponctuelle de la morbidité des personnes travaillant dans les locaux de fabrication. **Objet et méthodes:** En 2011 a été réalisée une analyse ponctuelle de la morbidité de 1361 personnes, engagées à la fabrication de roulements à billes. Les données initiales avaient été recueillies depuis les cartes des bilans de santé. L'analyse a été faite d'après les critères suivants: âge, ancienneté cumulative et ancienneté de travail dans cette entreprise.

**Résultats:** Le nombre total des maladies enregistrées est de 1094 pour 636 salariés. L'analyse en fonction de l'âge démontre que le taux de mortalité est le plus élevé dans le groupe des personnes âgées au-dessus de 55 ans -79.9%, et le taux le moins élevé se situe dans le groupe des personnes de moins de 25 ans – 8.19%. Prenant en considération la classification nosologique de la Classification statistique internationale des maladies et des problèmes de santé connexes (10e version), les taux attribués par ordre décroissant sont présentés comme suit: Maladies de l'appareil circulatoire – 31.44%; Maladies de l'œil et de ses annexes - 22.94%; Maladies de l'oreille et de l'apophyse mastoïde - 18.28%, Maladies du système ostéo-articulaire, des muscles et du tissu conjonctif – 11.97%.

**Conclusions:** 1. A été constatée une augmentation de l'atteinte pathologique associée à l'élévation de l'âge biologique des travailleurs. 2. L'étude de la morbidité ponctuelle incombe à la charge du Service de la médecine du travail auquel l'entreprise se trouve affiliée; il est tenu d'envoyer annuellement une analyse des données à l'attention de l'Inspectorat régional de la Santé. 3. En Bulgarie il n'existe pas de système statistique unifié analysant la morbidité ponctuelle des travailleurs en général et par branches.

**Mots-clés:** état de santé, classification nosologique, construction mécanique, morbidité ponctuelle, travailleurs

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## INTRODUCTION

**M**echanical engineering is one of the biggest industrial sectors in the European Union based on number of companies (about 169 000), employment (3,3 million people), production and formation of added value. With its share of 36% of the world market Europe is the biggest producer and exporter of machines in the world (1).

According to the Bulgarian legislation (2) employers must provide occupational medicine services to all workers in employment relation. Monitoring the medical status of employees of the companies they provide service for is a priority for the occupational medicine services. They have the obligation to present an annual summarized analysis of the employees' health condition for a one-year observation period to the employer and to the Regional Health Inspection according to the company address registration (3). This analysis includes a different amount of information depending on the number of employees: up to 30, from 31 to 100 and over 100 employees. As a whole one analysis consists of the following data: 1. General information, including average number of employees and allocation by gender; 2. Number of employees who had suffered an illness in the current calendar year, number of employees with registered illness (in patient charts), absolute number of cases (primary patient charts) – total and by nosological structure, in accordance with International Classification of Diseases and Related Health Problems, Revision 10 (ICD-10), number of days with temporary incapacity for work (from all patient charts – primary and following) – total and by nosological structure, in accordance with Classification of Diseases, number of cases with temporary incapacity for work with duration of up to 3 days (primary patient sheets), number of employees with 4 or more cases of temporary incapacity for work (primary patient sheets), number of employees with 30 or more days of temporary incapacity for work because of illnesses, number of registered occupational diseases, number of employees with registered non occupational diseases etc. 3. Data about the conducted periodic and mandatory medical examinations throughout the current calendar year; 4. Analyses and assessment of the indicators describing the health status of the employees, which includes different indicators; 5. Analysis of the connection between morbidity and the work conditions, conclusions and recommendations.

The analyses of the health status of the employees, presented to the occupational medicine services in the Regional Health Inspections by the serviced companies, are not summarized for economic activities and are not published either; statistics on the problem is not run in the Ministry of Health.

Since 2007 the National Social Security Institute in Bulgaria has had disposal of complete information about diseases of temporary incapacity for work and has paid monetary compensations for them.(4)

During the last decades a worldwide tendency has been observed for increase of compensations expenditure because of temporary incapacity for work. After carrying

out a research in six highly developed industrial countries, among 2825 employees who have used a leave for temporary incapacity for work for the average of 3 months, significant differences were observed at their return to work; for example after chronic low-back pains, estimating the differences in the social and health policy. (5)

The temporary incapacity for work in industrial countries has become a major problem for social health and for economy because of suffered losses in the production due to illness leave. The low-back pain is one of the most frequent reasons for long-term absence from work in USA and other West European countries. (6) A survey has determined that degree of intensity of musculoskeletal diseases is related not only to the assigned work but also to certain conditions such as distress, anger, dissatisfaction. (7) Working shifts including night labour leads to distress, cardiovascular disorders, metabolic problems, circadian rhythm disorders, etc. (for which sick leaves are taken because of temporary incapacity of work). (8) Nowadays the classical working day, from 7-8 a.m. to 5-6 p.m., from Monday to Friday concerns very few employees – 27% of the employed and 8% of the self-employed people according to the third European survey of labour conditions. (8,9) The presence of industrial noise even below exposition of work environment norms leads to extra-aural changes – stress reaction, changes of cardiovascular, endocrine and nervous systems. (10,11) The combination of the shifts-work regime and the noise factor in the working environment, which have chronic impact on the employees aggravate the extra-aural effects. The above mentioned environment factors are typical of the engineering sector.

An international company for production of bearings opens its own base in Bulgaria in 2002. The enterprise belongs to the sector Processing Industry, Production of Metal Articles without Machinery and Equipment (12) with the following activity - Production and trade of bearings, wrought ring bearings and metal and rubber seals. The Concern serves more than 40 industries such as: automobile and light motor truck production, wind energy, rail transport, engineering, medical equipment, food industry, cellulose and paper. The Concern has been certified by the International standard for Environmental Management 14001 (ISO 14001). Its various divisions have been certified in accordance with the demands of the International Quality Standard 9000 (ISO 9000) as well as the Occupational Health and Safety Standard 18001 (OHSAS18001). (13)

The goal of the present survey is to analyze morbidity with temporary incapacity for work of workers employed in the production of bearings, wrought and turned bearing rings and rubber-metal sealings.

## MATERIALS AND METHODS

An analysis of diseases with temporary incapacity for work was carried out in 2010 among 1334 employees in the production base of an international engineering company in Bulgaria (712 females – 53,41% and 622 males – 46,59%). The preliminary information about “general disorders”, “occupational accidents” and “occupational diseases” is

based on patient charts, submitted by the insurer to the occupation medical service responsible for the company. All other reasons ensuring compensation payments for other ensured social risks, in accordance with Bulgarian legislation have been excluded. Such reasons include caring for a disabled family member (child or adult), placing under quarantine, medical tests, labour readjustment, pregnancy, giving birth, balneotherapy, etc. (4) The present study has estimated disorders with temporary incapacity for work according to Batkis – Lekarev classification. (14) The impossibility for data comparison has been discussed concerning paid compensation for separate nosological units, on the basis of information from the National Social Security Institute in Bulgaria for 2010. (15)

When preparing the analysis the workers were divided by the following criteria:

- Employee's gender – male, female, relative share;
- Age groups – up to 25; from 26 to 35, from 36 to 45; from 46 to 55; above 55 – relative group shares;
- Total length of service;
- Service length within the company;

The methods of descriptive epidemiology and relative share comparison have been used for data processing.

## RESULTS

The average register staff employees number of an engineering company for the monitored period is 1334 people: 712 females (53,41% of all employees) and 622 males (46,59% of all employees). Their distribution according to age is presented by [fig. 1](#). This figure shows that the group of employees up to 45 years of age, i.e. “the young ones”, represents 58% of all employees. According to the age feature, the prevailing groups are from 35-45 and from 45-55. Significantly fewer in number are the employees in the groups up to 26 and over 55.

Not only the occupational environment factors but a number of other which have complex influence – age, length of service, gender, constitutional features etc. are also of importance for the emerging of diseases with temporary incapacity for work. The overlapping of the total length of service and that passed in the institution in question could become a “basis” where latent or newly formed pathological deviations may emerge, related to the risk factors of the work environment. For this reason it is considered important that the employment must be integrated. The classification of

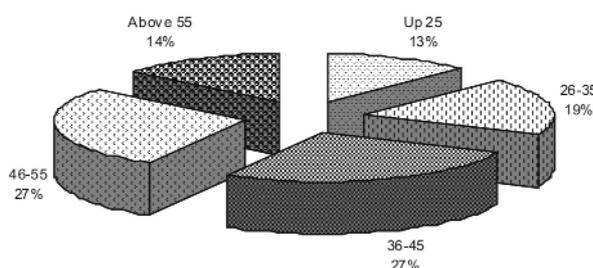


Figure 1 - Relative share of the persons, stratified by age (%)

Table 1 - Distribution of employees by age and service

Allocation to groups	Number of employees	%
<b>Age groups</b>		
up to 25	168	12,59
from 26 to 35	256	19,19
from 36 to 45	356	26,68
from 46 to 55	369	27,66
above 55	185	13,86
<b>Total length of service</b>		
up to 5 years	163	12,22
from 5 to 10 years	287	21,51
above 10 years	884	66,26
<b>Service length within the company</b>		
up to 3 years	505	37,85
from 3 to 10 years	802	60,12
above 10 years	27	2,02

employees has been presented according to their total length of service and employment within the particular company which is a subject of this research ([table 1](#)).

The table shows that the majority of the studied contingent are employees with total length of service over 10 years – 66,26%. A significant number of them has been working for the studied company for the recent years – from 3 to 10 years and more, being exposed to the same factors in the working environment.

The limiting factors of the working environment in the company may be combined in the following groups according to objective and subjective features:

1. Working shifts
2. Nervous-emotional strain related to the quality, precision and responsibility demand.
3. Psycho-sensor strain when carrying out visual control – removal of low quality components.
4. Strain in musculoskeletal system and connective tissue (lower limbs) – mainly standing, dynamic work posture.
5. Overload of the auditory analyzer – when working with machinery in loud environment with up to- and over the exposure figures which require taking action.
6. Strain in musculoskeletal system and connective tissue (upper limbs) – when executing hand operations.
7. Irritable and allergic effect of chemicals and mineral lubricants used in some workshops.
8. Danger of mechanical damage such as: entangling, pinching, squeezing, puncturing of the upper limbs by moving machine parts.
9. Mechanical damage resulting from stumbling, slipping, falling from the same or another level.
10. Dangers caused by vibrations – when working with single machines and equipment in some of the workshops.

During the observation period out of the total number of employees (1334), 807 had registered disorders (according to patient charts). The information about temporary incapacity for work allocated according to age group is presented in [table 2](#).

Table 2 - Temporary disability by age

Age groups	Number of employees	Number of sick persons	Number of cases of employees with a temporary disability	Days of diseases with temporary disability	Frequency of morbidity per cases per 100 employees	Frequency of days with diseases with temporary disability per 100 workers	Average duration of one case (days)	Average duration of disease an one worker with a temporary disability (days)
up to 25	168	138	289	1955	172,02	1163,69	6,8	14,2
from 26 to 35	256	169	373	3267	145,7	1276,17	8,8	19,3
from 36 to 45	356	193	368	4149	103,37	1165,45	11,3	21,5
from 46 to 55	369	202	428	6194	115,99	1678,59	14,5	30,7
above 55	185	105	214	3371	115,68	1822,16	15,8	32,1

The leading age group for presenting patient charts (number of cases) is the one up to 25, followed by the one from 26 to 35. It is obvious that the highest frequency of temporary incapacity for work for one hundred employees is the group up to 25. The same group has the lowest average length of a single case and the shortest amount of time required in terms of days per person. With longest average length per case and highest average length as number of days per person is the group over 55.

The case frequency for 100 of the diseased employees according to patient chart presented and allocated to age groups is as follows: up to 25 – 209,42%, 26 to 35 – 220,71%, 36 to 45 – 211,88% and over 55 – 203,81%.

The frequency of days with temporary incapacity for

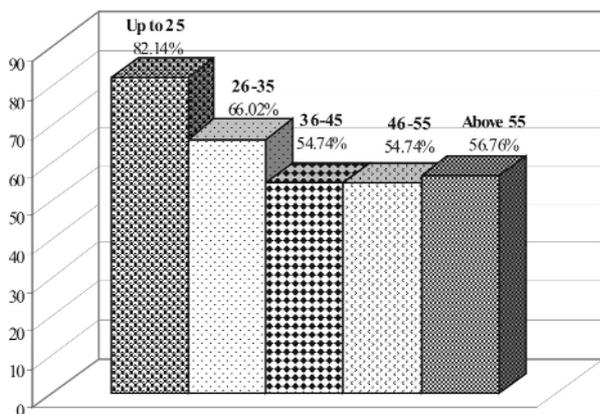


Figure 2 - Relative share of the persons with diseases with temporary disability, stratified by age (%)

Table 3 - Proportion of the number of patient charts with a temporary disability as nosological units (%)

Nosological structure within the International Classification of Diseases and Related Health Problems (10th revision)	Number of patient charts	Proportion (%)
I Certain infectious and parasitic diseases	158	9,45
B34 Viral infection of unspecified site	123	
II Neoplasms	19	1,13
VI Diseases of the nervous system	92	5,5
G54 Nerve root and plexus disorders	48	
IX Diseases of the circulatory system	92	5,5
I 10 Essential (primary) hypertension	28	
I 11 Hypertensive heart disease	21	
I 20 Angina pectoris	13	
I 69 Sequelae of cerebrovascular disease	4	
X Diseases of the respiratory system	569	34,03
J 06 Acute upper respiratory infections of multiple and unspecified sites	259	
J 20 Acute bronchitis	163	
XI Diseases of the digestive system	111	6,64
K 29 Gastritis and duodenitis	42	
K 52 Other noninfective gastroenteritis and colitis	42	
XII Diseases of the skin and subcutaneous tissue	41	2,45
XIII Diseases of the musculoskeletal system and connective tissue	258	15,43
M 17 Gonarthrosis [arthrosis of knee]	21	
M 50 Cervical disc disorders	45	
M 51 Other intervertebral disc disorders	116	
M 65 Synovitis and tenosynovitis	12	
XIV Diseases of the genitourinary system	88	5,26
XIX Injury, poisoning and certain other consequences of external causes	157	9,39
S 61 Open wound of wrist and hand	22	
S 62 Fracture at wrist and hand level	7	
S 82 Fracture of lower leg, including ankle	12	
S 92 Fracture of foot, except ankle	5	
Others	87	5,2
Summary	1672	100

work for a 100 of the diseased employees is as follows: up to 25 – 1416,67%, 26 to 35 – 1933,14%, 36 to 45 – 2149,74%, 46 to 55 – 3066,34% and over 55 – 3210,48%.

The relative share of recently diseased children allocated by age is presented in fig. 2. As shown there the highest relative share belongs to the youngest group – up to 25. The difference towards the relative share of the group over 55 has high degree of truth ( $p < 0.001$ ).

The total number of cases is 1672 (primary patient charts).

The allocation of patient charts by diagnoses in accordance with the International Statistical Classification of Diseases and Problems related to health (10th revision) is shown in table 3.

According to the nosological structure the greatest number of patient charts were used for diseases of the respiratory system, followed by diseases of the skeletal-muscular system and connecting tissue, some infectious and parasitic diseases (Severe virus infections), traumas of mainly non labour origin, etc. It can be noted that from Diseases of the musculoskeletal system and connective tissue, spinal disorders prevail – 161 out of 258 registered cases in the

Table 4 - Percentage of the number of days with a temporary disability as nosological units (%)

Nosological structure within the International Classification of Diseases and Related Health Problems (10th revision)	Number of patient charts	Proportion (%)
I Certain infectious and parasitic diseases	758	4,00
B34 Viral infection of unspecified site	404	
II Neoplasms	817	4,31
VI Diseases of the nervous system	1040	5,49
G54 Nerve root and plexus disorders	414	
IX Diseases of the circulatory system	1133	5,98
I 10 Essential (primary) hypertension	148	
I 11 Hypertensive heart disease	235	
I 63 Cerebral infarction	104	
I 69 Sequelae of cerebrovascular disease	233	
X Diseases of the respiratory system	3061	16,16
J 06 Acute upper respiratory infections of multiple and unspecified sites	1019	
J 20 Acute bronchitis	920	
XI Diseases of the digestive system	1188	6,27
K 29 Gastritis and duodenitis	155	
K 40 Inguinal hernia	355	
K 52 Other noninfective gastroenteritis and colitis	154	
XII Diseases of the skin and subcutaneous tissue	618	3,26
L 05 Pilonidal cyst	206	
L 08 Other local infections of skin and subcutaneous tissue	247	
XIII Diseases of the musculoskeletal system and connective tissue	4340	22,92
M 16 Coxarthrosis [arthrosis of hip]	206	
M 17 Gonarthrosis [arthrosis of knee]	453	
M 23 Internal derangement of knee	215	
M 50 Cervical disc disorders	677	
M 51 Other intervertebral disc disorders	1370	
M 65 Synovitis and tenosynovitis	593	
XIV Diseases of the genitourinary system	932	4,92
N 11 Chronic tubulo-interstitial nephritis	167	
N 20 Calculus of kidney and ureter	159	
XIX Injury, poisoning and certain other consequences of external causes	4101	21,66
S 61 Open wound of wrist and hand	380	
S 62 Fracture at wrist and hand level	309	
S 82 Fracture of lower leg, including ankle	1244	
S 92 Fracture of foot, except ankle	314	
Others	948	5,01
Summary	18936	99,98

section. The most frequent are Damages in the interspinal discs in other sections than neck.

Table 4 displays the data for days with temporary incapacity for work by nosological units for the period of observation (total of 18936 days from all patient charts – primary and following).

The greatest number of days were used for Diseases of the musculoskeletal system and connective tissue (4340), a significant part of those were for Damages in the interspinal discs (2047 days), followed by degenerative disorders of joints and lower limbs (874 days) etc. Second place is for Injury, poisoning and certain other consequences of external causes (most commonly – broken bones) followed by

Table 5 - Benchmarks for assessing norms for morbidity with temporary disability under the indicative of the country (classification Batkis-Lekarev)

EVALUATION	AN ANNUAL INDEX	
	Frequency of morbidity of cases per 100 employees	Frequency of days per 100 employees
VERY LOW	Up to 60	Up to 600
LOW	60 – 80	600 - 800
AVERAGE	80 – 100	800 - 1000
HIGH	100 – 120	1000 - 1200
VERY HIGH	Over 120	Over 1200

Diseases of the respiratory system with leaders – Severe infections of the upper respiratory tract; Diseases of the digestive system, Diseases of the circulatory system etc.

Attention was drawn by 421 cases of employees who had used a leave for temporary incapacity for work with length up to 3 days (primary patient charts) – 25% of all cases of Morbidity with temporary incapacity. Practice shows that the frequent use of short-term leaves for temporary incapacity for work implies prevalence of social and everyday problems over labour environment factors.

According to N. Tzacheva (14) the highest-risk groups are:

- People with 4 and more cases with primary patient charts for temporary incapacity for work – 104 people in this case – 13% of the total number diseased employees and 8% of all employees.
- People with long-term leave (30 and more days) temporary incapacity for work because of diseases – 161 people in this case, i.e. 12% of the total staff at the company and 20% of the diseased employees.

For the period in question there are no new cases of registered occupational diseases but there is one case of “labour accident” because of trauma (The diagnosis is S 92 Fracture of foot, except ankle). The case is now included in the general information in section XIX Traumas, poisonings and some other consequences of external cause impact (tables 3&4)

The relative disease share with temporary incapacity for work for the period is as follows:

- According to the case frequency indicator per 100 employees – 125,3 cases.
- According to the day loss frequency indicator per 100 employees – 1409,6 days.

When comparing with orientation normative groups by Batkis – Lekarev a very high frequency of disease cases were defined per 100 employees as well as extremely high frequency of days loss per 100 employees (table 5).

## DISCUSSION

The presented results show that the number of recently diseased people and the number of cases i.e. the number of patient charts is higher within younger age groups (up to 25

and in the interval 26 to 35) as compared to older ones (46 to 55 and over 55). It is logical to expect the opposite – increase of relative share of diseased people and respectively the number of cases within older employees. It considered the high percentage of short-term leaves because of diseases with temporary incapacity for work within younger employees is due not so much to working conditions but mainly to the influence of social factors – social implementation in the working team, reasons related to children raising until 14 years of age, caring for elderly parents who must not be neglected and problems connected with adaptation at work, adaptation to working shifts (night labour included) etc. This is supported by the fact that leaves with longest average length and number of days per case are noticed in the group above 55, followed by 46 to 55 while within younger employees (up to 25) the leaves for temporary incapacity for work are frequent but shortest.

By nosological structure and according to ICD-10, the biggest relative share of patient charts is used for Diseases of the respiratory system followed by Diseases of the musculoskeletal system and connective tissue, Certain infectious and parasitic diseases (most commonly severe virus infections), Injury, poisoning and certain other consequences of external causes etc. The high relative share of the severe virus infections increases the one of the whole class Diseases of the respiratory system, because of frequent complications of the respiratory tract. These results confirm the ones derived by Menzlová M, Smeliková E and Keka M when examining the morbidity with temporary incapacity for work in Czech Republic.(15) Studies in Bulgaria partly match with the ones quoted from the Czech Republic.(16)

In the current case the frequency of respiratory diseases is hard to explain because the work halls are well heated in the cold part of the year and the chemical pollutants are well below the limit exposure figures (mainly mineral oils). It is logical to expect a higher frequency of respiratory diseases in the winter months but in this case there is a lack of convincing seasonal dependency.

Second by frequency and first by influence are Diseases of the musculoskeletal system and connective tissue. This disease profile can be explained by work environment factors, graded by objective and subjective indicators by the experts who had inspected health risk and safety as well as by the subjective evaluation of the workers for the level of popularity of these factors. A positive connection between labour conditions (mainly the uncomfortable working posture), the age of employees and the manifested diseases has been established by a study in the Netherlands. It is determined that older employees are more susceptible to skeletal-muscular system diseases. They have more health issues than younger employees but suffer less injuries due to their bigger professional experience. (17) French authors emphasize that in addition to age and uncomfortable work posture, factors like diabetes, obesity, high mental stress, repetition of the work task etc. have negative impact. (18)

It is a known fact that the influence of diseases is graded by the longevity of the leave for temporary incapacity to work. In support of the above it has been determined that

on second place by influence are Traumas, poisons and some other consequences of external cause impact. This is caused by the need of lengthy treatment and the following rehabilitation. It can be noted that for Broken shank bone, including the ankle (condition S82) more than 60 days are used for the majority of patient charts.

After comparing the present data referring to a one year period, with the orientation normative groups by Batkis – Lekarev, very high “Frequency of disease cases per 100 workers” and “Frequency of day losses per 100 workers” have been determined. Having in mind the organization for paying this kind of compensations in Bulgaria, it is considered that the presented data have no direct impact on the labour conditions but are rather related to the everyday factors including abuse with this type of leaves. The employers pay for the first three days of each primary patient chart and the rest is paid by the National Social Security Institute. Employers and the National Social Security Institute in Bulgaria are physically incapable of coping with the abuse of the type of documentation.

Moreover the comparison of the morbidity with temporary incapacity for work among companies in the same sector or by indicators for the whole country has been obstructed. This is due to the fact that the National Social Security Institute in Bulgaria keeps statistics for the paid compensations (19) and their number differs from the number of the issued patient charts i.e. one more compensations are likely to be paid by National Social Security Institute. Summarized data for this country are not available to show morbidity level with temporary incapacity for work according to the number of patient charts and disease classification by the International Disease Classification – 10 revisions.

## CONCLUSION

1. Very high level of morbidity with temporary incapacity for work has been detected among workers engaged in the production of bearings, bearing rings and metal-rubber sealings in respect to the following indicators: Frequency of morbidity cases per 100 employees and Frequency of day losses per 100 employees in accordance with Batkis- Lekarev classification.
2. There exists organizational and information gaps in reporting point prevalence which does not permit comparisons between indicators on company and relevant economic sector levels.

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