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Critical issues and perspectives of the diabetic worker

Ivo Iavicoli[1], Aldo Todaro[2], Lorena Airaghi[3], Adriana Branchi[4], Luisella Vigna[2]

[1] Dipartimento di Sanità Pubblica, Università degli Studi Federico II, Napoli
[2] UOC Medicina del Lavoro, Clinica del Lavoro L. Devoto, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milano
[3] Medicina Interna ad Indirizzo Metabolico, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milano
[4] Medicina Interna, Dipartimento di Scienze Cliniche e di Comunità, Università degli Studi, Milano, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milano

The condition of chronic hyperglycaemia due to shortcomings in insulin secretion and/or action is characteristic of different metabolic disorders that are commonly referred to as diabetes (1). According to the diagnosis and classification criteria of the American Diabetes Association (ADA) there are different types of diabetes (1). Type 1 diabetes is caused by a cellular-mediated autoimmune destruction of the pancreatic β-cells and usually determines an absolute insulin deficiency, whereas type 2 diabetes is characterized by an insulin resistance, commonly associated with a relative insulin deficiency (1). In the long run, if not adequately controlled, the condition of sustained and prolonged hyperglycaemia can result in extremely important and severe complications such as nephropathy, retinopathy, peripheral and/or autonomic neuropathy and sexual dysfunction (1, 2, 10). Recently, it was estimated that 422 million adults aged over 18 are living with diabetes, South-East Asia and Western Pacific Regions being the areas with the largest numbers of affected people (9). In this regard, it should be noted that the majority of diabetic subjects are diagnosed with the disease when they are in full working age. For example the International Diabetes Federation estimated that there are 326.5 million people of working age (20-64 years) with diabetes (4) and the forecasts for the near future do not seem to be promising, considering that a net increase of about 2% of global prevalence of the disease in adults is expected by 2040 (5).

These figures clearly show the need of special attention to the complex relationship between this pathology and the working conditions experienced by diabetic workers in order to guarantee, even in workplaces, an optimal management of diabetes, thus ensuring the well-being of workers, together with implementing their work ability. In Italy, a working group of the Italian Society of Occupational Medicine (SIML), the Italian Diabetes Society (SID) and the Italian Association of Medical Diabetologists (AMD) has been actively involved in this topic for several years and has recently published a consensus paper reviewing some specific occupational risk factors, suggesting strategies and tools to properly treat diabetes in the workplace, as well as supplying practical guidance to face the issue of fitness for work (3). Nevertheless, much work remains to be done on this topic and further research is needed in order to address other occupational risk factors, implement job retention strategies and improve the working conditions of diabetic workers.

In this context, an event was recently held in Milan entitled "Approccio multi-disciplinare al lavoratore con diabete: dialogo tra medici del lavoro, diabetologi e specialisti" [Multi-disciplinary approach to the worker with diabetes: dialogue between occupational physicians, diabetologists and specialists] which pointed out that a key role to achieve the aforementioned goals lies in the close collaboration between occupational physicians (OPs), diabetologists and other specialists (including where necessary, cardiologists, nephrologists, ophthalmologists, neurologists). In their Editorial, Perseghin and Riboldi highlighted how the multidisciplinary analysis of the interplay between the characteristics of the specific job requirements on the one hand and the

Corresponding author: Luisella Vigna, UOC Medicina del Lavoro, Clinica del Lavoro L. Devoto, Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Milano - E-mail: luisella.vigna@policlinico.mi.it

individual's health status of the diabetic worker on the other is a formidable working tool. It effectively manages any criticality related to the therapeutic treatment (e.g. hypoglycaemia), the complications of diabetes (which, in turn, represent the main potential obstacle to the issue of fitness for work) and to the possibility of safely and effectively undertaking the working activities.

In detail, the risk of hypoglycaemia and the presence of chronic complications might represent an element of criticality mainly when the diabetic worker is faced with some particular occupational risk factors such as those described and discussed in the priority list of the consensus document of Iavicoli et al. (3). In this regard the case reports, included in this special issue, allow a further step in the analysis of this problem by evaluating new occupational risk factors and introducing fresh elements for discussion. For example, the studies by Cirla and Martinotti, describing two cases of diabetes in office workers exposed to video display units (VDUs), work-related stress and use of company car, showed that the aforementioned multidisciplinary approach to the diabetic worker is strongly encouraged, especially when the complications of the disease become an obstacle to the job performance (e.g. use of VDUs) or pose a safety risk (use of company car).

Cirla observed that type 2 diabetes is characterized by an asymptomatic phase between the actual onset of diabetes hyperglycaemia and clinical diagnosis. This phase has been estimated to last at least 4-7 years; consequently 30-50% of type 2 diabetic patients remain undiagnosed. Thus, untreated hyperglycaemia is an explanation for the relatively high prevalence of retinopathy in newly diagnosed diabetic people. The workplace health screening program could be an opportunity to check diabetes and its complications. According to Martinotti hyperglycaemia may be responsible for serious chronic damage .among patients with type 1 diabetes. Insulin pump therapy, compared with injection therapy shows lower risks of severe hypoglycaemia, diabetic ketoacidosis and better glycemic control.

On the other hand, also the case report proposed by Belluigi, regarding a diabetic worker exposed to shift-work and night-time work, showed that a concerted and synergistic interaction of OPs and diabetologists allows to obtain a greater probability of therapeutic success; it improves also the work skills of affected workers. With regard to this last issue it is noteworthy to underline that the effective cooperation, experienced in the aforementioned studies, between the various specialists has guaranteed the identification and the adoption of the best and most appropriate reasonable accommodations for diabetic workers. Belluigi also pointed out that more than 90% of the patients with type 2 diabetes are overweight or obese and weight loss slows the progression of diabetes complications. Both drugs and nutritional advice have a major role in the treatment approach. In the case reported, an appropriate balance of energy requirements together with metformin reached the metabolic target.

The effective cooperation experienced in the above mentioned studies has also worked positively in the case of the Airforce pilot affected by Type 2 diabetes (with medico-legal implications) reported by Palumbo and Marfia. Here again the multidisciplinary approach and the close cooperation between military doctors, diabetologist, cardiologist and OPs has allowed him to retain his professional skills and fly in utter safety. Marfia has shown that in a patient with well controlled type 2 diabetes, cardiovascular autonomic neuropathy may be present with an annual incidence of 1.8 %. It is possible to perform non-invasive specific tests in order to evaluate autonomic cardiovascular function.

The need for greater integration and more effective collaboration between OPs and other medical specialists, aimed at a better and more effective management of the diabetic worker (and related issues in the workplace), has been underlined and promoted by this working group since the beginning of its activities. Unfortunately, it is widely acknowledged that communication between OPs and other physicians, especially general practitioners (GPs), is often lacking or very poor, at best inadequate and sometimes also conflictual (7, 8). Actually, this sort of incommunicability would seem to involve several medical specialists. Indeed, in their article Banchini and Santelia pointed out that in Italy only 29% of diabetes centres have adopted integration/communication models or tools to cooperate and share information with GPs, while in general there is still no codified collaborative procedure between these professional figures. These considerations highlight

what is undoubtedly a weakness of the diabetic patients' (worker or not) management system which also severely limits their quality of life, as when they are prescribed identical diagnostic tests by different specialists at different times. However, at the same time the awareness of this issue offers a great opportunity since, considering the central role of GPs (in Italy each GP treats an average of over a hundred diabetics who visit him/her 8-15 times a year), the definition of integrated diagnostic and therapeutic pathways shared between GPs, OPs and diabetologists would greatly contribute to improving the well-being of the diabetic worker. In fact, data from the Lombardy Region demonstrate that where this shared and multidisciplinary approach is implemented, the results are encouraging, showing a better control of blood sugar levels and body weight.

In this regard, the main therapeutic target is to maintain optimal blood glycaemic levels in order to avoid (especially in the long run) the occurrence of the chronic diabetes-related complications which could importantly compromise the working capacity of the diabetic subject. In most cases the pharmacological treatment with insulin or oral agents, such as sulfonylureas and glinides, represents the cornerstone on which the therapeutic strategy is based. However, it should be noted that the administration of these drugs significantly increases also the risk of hypoglycaemia which, in turn, especially in the presence of particular occupational factors, can pose a serious risk to the health and safety of the diabetic worker exposing him to sudden loss of consciousness. Therefore, as well argued in two articles included in this special issue, the search and definition of effective therapeutic schemes using drugs capable of guaranteeing a good control of the glycaemic levels with minimal side effects is an urgent need. In detail, De Gennaro Colonna described the main characteristics of nutraceuticals (bioactive compounds mostly of plant origin), their beneficial effects and the potential use of these compounds in the treatment of type 2 diabetes mellitus in association with the traditional hypoglycaemic drugs. It is noteworthy to underline that the data available so far demonstrate that these drugs, in addition to improving a good hypoglycaemic control, have also important positive effects on the lipidic profile, the antioxidant status or endothelium dependent-vasodilator function.

On the other hand, it is also important to point out that maintaining an optimal glyceamic control cannot be exclusively based on pharmacological therapy but also requires other types of interventions such as diet and therapeutic education. In this context, Orsi and Resi, describing the main physio-pathological characteristics, the diagnostic criteria and the therapeutic strategies of the disease, highlighted the key role of the OPs in the prevention and management of diabetes. In fact, a modern OP is a leading expert not only in the assessment of fitness for work but also in the evaluation of work ability, the management of employee's wellness programs and the implementation of workplace health promotion (6). Considering that a healthy lifestyle is essential to allow to adequately manage the diabetic disease, the importance that the role and functions of OPs have in this area is quite evident. They individually both raise the awareness of the diabetic worker and contribute to the realization of adequate and specific health promotion campaigns in the workplace regarding the adoption of a healthy diet, increased physical activity, smoking cessation plan and maintenance of a healthy body weight. For example, the diabetes prevention and screening strategy provided through a workplace campaign by Cirla and Martinotti in a company of the advanced tertiary sector demonstrated the strategic role played by the OPs.

Last but not least, it should be noted that several research groups, starting from the evidence that some risk factors are implicated in the etiopathogenesis of cardiac and lung diseases, have recently investigated the possible association between the occurrence of diabetes and the exposure to different environmental pollutants. In this regard, Carugno carried out an interesting literature review on this topic, focusing on the exposure to air pollution (AP) and environmental noise and their possible role in increasing the risk of diabetes. This is an important topic since these factors might also be present in the workplace. Current evidence points to a possible correlation between AP and diabetes, whereas the results concerning exposure to noise and this disease are limited. Nevertheless, it is essential to consider the findings of these studies with great caution since there are still many critical aspects that need to be clarified such as for example the influence of the various pollutants included in the definition of air pollution or the role played by possible confounders factors.

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