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Environmental Burden of Disease from Municipal Solid Waste Incinerator

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Ambient air near or far from a municipal solid waste incinerator (MSWI) produced more fine particles, including PM_1, $PM_{2.5}$, and PM_{10} than usually non-contaminated air. Inhalation might be the primary exposure route of heavy metals, i.e. Zn, Cu, Pb, Cd, Fe, Cr and Mn in various types of particles in ambient air, including PM_1, $PM_{2.5}$, and PM_{10} for inhabitants of places nearby these areas especially children and adolescents living in the neighborhood of MSWI[1]. For example, very toxic persistent organic pollutants (POPs) such as polychlorinated dibenzo-p-dioxins (PCDD) and dibenzofurans (PCDFs) can cause various health outcomes such as lung cancer[2], thyroid disorder and other kinds of cancers (10.10% vs. 8.28%, $p < 0.01$)[3]. The evaluations show that albeit increase of open burning incinerators to PCDD/PCDFs discharges has been decreasing in the world's countries. However, it continued to be the principal source of emissions in Iran, according to about 45.8% out of total emissions in 1990 to 35.7% in 2010[2]. A limited number of studies in the world noticed that heavy metals such as Zn, Pb, Cu, Cr, and Cd could be concentrated easily in fine particles, which can be constructed and transformed into fly ash during incinerators' agitation process in the MSWI, in particles < 0.8 mm. These particles contain lower concentrations of nutrient content and higher concentrations of heavy metals [4,5] obtaining PM_{10} and $PM_{2.5}$ fractions for physic-chemical analysis in the body. Therefore, the mentioned pollutant has been associated with fetal growth [6]. Children living near an MSWI would suffer from higher determines internal exposure i.e. body burdens of PCDD/Fs [7]. Significantly higher body burden of PCDD/Fs and PCBs in breastfed newborns near MSWI are observed ($p < 0.05$)[8]. The environmental burden of disease (EBD) of population attributable fraction respiratory and cardiovascular disease (CVD) is 0.12% and 0.10%, respectively. NO_2 and SO_2 can cause and exacerbate many public health problems such as CVD, respiratory disease[9], mortality (2%)[10], low-birth weight, and lung cancer[11]. In another study, no enhanced risk of congenital anomalies was determined concerning modeled PM_{10} emissions. However, , a small amount of risk exists with regard to congenital heart diseases, genital anomalies related to MSWI[12], respiratory mortality[13], and cardiovascular mortality [14]. Teenagers living around the MSWI area may not suffer from a significant long-term accumulation of heavy metals such as Cd or Cr. No distinct early renal impairment is observed, but urinary levels of

Cd (U_Cd) which were emphatically correlated with the N-acetyl- β-D-glucosaminidase (NAG) and U_Cr levels which were positively associated with the levels of U-NAG, retinol-binding protein (U-RBP), and β_2-microglobulin (U-BMG) [15] were founded in these age group. The children living near incinerator experienced increased body burdens of heavy metals, dominant genetic and epigenetic modifications, blood levels of Cr, Pb which are correlated with global DNA hypomethylation, and global DNA hypermethylation [16]. More studies observed that PCDD/PCDFs are often emitted into the ambient air followed by an MSWI, and other centers affiliated with burning facilities [7]. The daily intake doses were determined to be developed with the opening of new waste incinerators in Iran [17,18]. Other studies evaluated the developing trend in intake doses of PCDD/PCDFs emissions and pollutants in Iran [2]. Such high levels of emissions, high doses of pollutants' intake, and their developing trend in Iran are considered as the main health risks in Iran. As a result, more research is required with more rigorous methods. However, this should not circumvent taking proper management actions against these pollutants emission. Therefore, there is a requirement to pollutants emitted control from MSWI. Many methods have been used to control pollutants emitted from these centers[19-21]. Until now, there is no approved standard for PCDD & PCDFs emission from incinerators in Iran. Revision of the WHO concerning approved guidelines might be a suitable starting point to control PCDD & PCDFs emissions in the world. Although the one risk factor emissions, which is an incinerator, are small, the burden of disease (BE) can be notable for public health when population exposure is taken into concern. Policymakers, who are responsible for estimating and controlling from air polluting sources, should consider the enormous BE caused by toxic chemicals that are emitting from MSWI.

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