Epidemiology of miscarriage

Carlo La Vecchia [1]

1) Department of Clinical Sciences and Community Health, Università degli Studi di Milano, via Venezian, 1 – 20133 Milano, Italy

CORRESPONDING AUTHOR: *Carlo La Vecchia, Department of Clinical Sciences and Community Health, Università degli Studi di Milano, via Venezian, 1 – 20133 Milano, Italy. E-mail: carlo.lavecchia@unimi.it*

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Miscarriages account for about one in six/one in seven pregnancies, and probably over one in five excluding induced abortions, i.e. over 20 million events per year. However, any precise and valid estimate is made difficult by uncertainties in diagnosis, ascertainment, distinction in registration between induced and spontaneous abortions, and certification. These uncertainties vary across geographic region, country and socio-economic status.

Various cycles (4th to 6th) of the US National Survey of Family Growth (NSFG), based on nationally representative samples of non-institutionalized women over the period 1975-2005 (Lang and Nuevo-Chiquero, 2012), estimated that 74% of all pregnancies in women 13 to 53 ended up in births, 12% in induced abortions, and 13% in miscarriages. There was a rising trend over time in miscarriages, from about 12.5% of all pregnancies in 1985 to over 16% in 2005. When induced abortions were excluded, these estimates rose from about 18% to slightly over 20%.

The interpretation of these, somewhat surprising, findings, is not obvious. The major determinants of miscarriages were education, age at conception, right time of pregnancy, and previous history of miscarriages. More frequent pregnancies at later age may partly explain the observed unfavorable trends in miscarriages, which however was observed also in women aged 13 to 35, and even 13 to 25. Lifestyle habits (i.e., changes in smoking and drug abuse) are also unlikely to largely explain the trends observed.

Thus, the most likely explanation is the availability of easier and better pregnancy tests, i.e. the home pregnancy tests which have been available since the late 1970's, and hence widely used since the 1980's. Indeed, most of the increase in the proportion of miscarriages was observed between the mid 1980's and the mid 1990's, with little change thereafter. Thus, the real trends and proportion of miscarriages in the USA are difficult to interpret, but the changes over the last few decades are unlikely to have been major.

An update of pregnancy losses among US women to 2011, also based on more recent releases of the NSFG database, confirmed a recent increase of miscarriages from 17% to over 20% of pregnancies, excluding induced abortions, over the period 1990-2010 (Rossen et al., 2018). The rise in proportions was observed in various subsequent age groups from 15-19 to 30-44, with proportions over 25% in the older age group. More important, the rise was larger, or concentrated, in early pregnancy losses (3.5%, i.e. two thirds miscarriages over recent calendar periods), again supporting the key role of improved and more widely available pregnancy tests in influencing such trends. Still, the overall rise in total pregnancy losses was 2% per year over the 20-year period considered. This declined to 1% after adjustment for maternal age and other maternal characteristics.

This pattern of trends has to be considered with the background well known decline in pregnancy rates, birth rate and mostly induced abortion rate over recent decades in the USA (Ventura et al., 1999). Determinants of pregnancy loss are various indicators of low socioeconomic status, and, more strongly, history of previous pregnancy losses (Price, 2006).

Over the last few decades, there was a (non consistent) rise in chromosome abnormalities among spontaneous abortions, both in the USA and Australia (Hardy et al., 2016). This is largely, or totally due to changes over time in maternal age, i.e. a larger proportion of pregnancies above age 25. Still, this may at least in part account for the increased proportion of registered miscarriages, when such statistics are not adjusted for age.

Scanty available data from China (Li et al., 2016), also report a large rise (over 3-fold) in miscarriages between 2003

and 2013. Substantial rises were reported in ectopic pregnancies and hydatidiform mole, too, pointing to a key role of improved registration of these conditions in China over recent calendar year. Increased mean maternal age (from about 27 in 2003 to 29 in 2013) may also partly, but not largely, explain the observed trends in registered miscarriages.

An additional, relevant methodological issue in estimating and evaluating the proportion of miscarriages is the changing definition of timing for stillbirths (Smith et al., 2018). Stillbirths were traditionally defined at 28 weeks of completed gestational age. If the proposal to decrease stillbirth definition to 22 or 24 weeks (in high-income countries) will be accepted, this would lead to a decreased proportion of estimated miscarriages in the future. Stillbirths between 22 and 28 weeks of gestation account for 33 to 40% of the about 2.6 stillbirths estimated globally (Smith et al., 2018, Temmerman and Lawn, 2018). Thus, re-classifying about one million events, would lead to an about 0.5-1% decline in the estimated proportion of miscarriages, i.e. from 16 to 15% of all pregnancies.

In conclusion, data from high-income countries, including China, indicate an appreciable rise in the proportion of miscarriages over the last four to five decades. However, the key determinants of such apparent rises are better ascertainment and definition of miscarriages, essentially due to the widespread availability of modern home-based pregnancy tests, together with better registration is selected countries. Thus, recent trends in miscarriage are difficult to interpret.

Previous history of miscarriages is the strongest determinant of miscarriages. Additional risk factors are advanced maternal age, smoking, low socio-economic factors and related lifestyle and medical correlates.

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