Preplanned Studies

Trends in the Prevalence of Births with Chromosomal Abnormalities — Haidian District, Beijing Municipality, China, 2013–2022

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Summary

What is already known about this topic?
The primary causes of early miscarriage and stillbirth are chromosomal abnormalities (CAs) whose prevalence has been observed to increase in recent years.

What is added by this report?
According to data received from a hospital-based birth-defect surveillance system in the Haidian District, Beijing, there was a significant increase in the prevalence of CAs along with most subtypes from 2013 to 2022. This noted increase in the reported prevalence is potentially attributable to factors such as a rise in maternal age, alongside the enhanced detection efficacy resulting from the utilization of noninvasive prenatal testing.

What are the implications for public health practice?
The escalating prevalence of sex CAs and other previously rare CAs pose novel challenges for genetic counseling and healthcare practitioners. These professionals are tasked with the accurate evaluation and interpretation of detection data, which must then be conveyed appropriately to patients. Furthermore, it is imperative to intensify health education efforts to assist women in making informed treatment decisions, considering the diverse prognoses associated with different CAs.

Chromosomal abnormalities (CAs), which encompass both numerical and structural variants, present as common birth defects. These defects are a predominant factor behind early miscarriage and stillbirth (1). Moreover, they can lead to congenital anomalies such as mental retardation, developmental delays, and multiple malformations in newborns (2). Although recent studies in certain regions have indicated an uptick in the prevalence of CAs, there is an ongoing need for more research into some underlying subtypes (3–4). In this study, we assessed the trends and prevalence of CAs in Beijing’s Haidian District from 2013 to 2022. Our findings revealed a substantial increase in the prevalence of CAs in the Haidian District, with the rate rising from 29.46/10,000 in 2013 to 82.74/10,000 in 2022. Additionally, the prevalence of some subtypes, such as autosomal trisomies, sex CAs (SCAs), and microdeletion/microduplication, evidenced a significant rising trend. The escalating prevalence of SCAs and other previously rare CAs necessitates new strategies for genetic counseling and poses fresh challenges for health professionals. It’s critical that healthcare practitioners accurately evaluate these detection results and interpret them appropriately to patients. Strengthening health education initiatives will support women in making informed treatment decisions based on the diverse prognoses of CAs.

This study analyzed data from a hospital-based birth defect surveillance system in the Haidian District, details of which were discussed in a previous publication (5). Briefly, all pertinent healthcare institutions (inclusive of 18 community health service centers, midwifery agencies, and children’s hospitals) within the Haidian District are mandated to complete unified forms, registration cards, and report the total count of perinatal infants, alongside detailed individual information on cases of birth defects and infant mortality. Pregnant women were advised to undergo non-invasive prenatal screenings to detect CAs. Owing to technological progression, detection methods have evolved from maternal prenatal serum screening to non-invasive prenatal testing (NIPT). According to the guidelines set out by the Beijing Municipal Health Commission, a prenatal diagnostic rate exceeding 90% is required, with further diagnoses for newborns presenting post-birth abnormalities. The categorization of CAs was conducted in line with the International...
Statistical Classification of Diseases and Related Health Problems, 10th Edition. Depending on the clinical examination, different CAs were classified under three primary groups: autosomal trisomies, SCAs, and other CAs (6). CAs of a structural nature (microdeletions, microduplications, translocations, inversions) were further delineated. The annual CAs incidence was calculated by dividing the total count of reported CAs cases by the total number of perinatal infants within that year. A Joinpoint regression model was developed using Joinpoint software (version 4.9.1, Information Management Services, Inc. Calverton, MD, USA) to estimate the average annual percentage change (AAPC) in the prevalence of CAs. Two periods were distinguished according to the Joinpoint regression analysis, and the chi-square test and Fisher’s exact test were carried out using R software (version 4.0.5, R Development Core Team, Vienna, Austria) to compare the characteristics distributions in births with CAs between different periods. P values equal to or less than 0.05 (two-tailed) were deemed statistically significant.

Between 2013 and 2022, a total of 364,758 births were recorded, along with 1,676 cases of CAs resulting in a prevalence of 45.95 per 10,000 births. The types of CAs and their prevalence over this time period are displayed in Table 1. Over this period, the prevalence of CAs manifested an increasing trend, escalating from 29.46 per 10,000 in 2013 to 82.74 per 10,000 in 2022, which equates to an AAPC of 13.4% [95% confidence interval (CI): 8.3%, 18.8%].

The prevalence of autosomal trisomies climbed from 19.18 per 10,000 in 2013 to 29.67 per 10,000 in 2022 (AAPC=7.5%, 95% CI: 5.7%, 9.4%). Specifically, trisomy 21 and trisomy 18 syndromes displayed a significant upward trend in prevalence (Trisomy 21: AAPC=6.9%, 95% CI: 4.6%, 9.2%; Trisomy 18: AAPC=8.2%, 95% CI: 4.7%, 11.9%), whereas trisomy 13 syndrome did not (AAPC=1.0%, 95% CI: −17.2%, 23.2%).

SCAs prevalence increased from 4.91 per 10,000 in 2013 to 20.89 per 10,000 in 2022 (AAPC=21.3%, 95% CI: 15.9%, 27.0%). Individual SCAs subtypes (chromism, 47XXX, 47XY, 47XXY, 45X) all demonstrated significant increasing trends over the same period, all with AAPC values greater than 0% and P-values less than 0.05.

The prevalence of other CAs also increased over the past 10 years (AAPC=22.6%, 95% CI: 16.5%, 30.1%) with significant upward trends observed in microdeletion/microduplication, translocation, and inversion (each with AAPC values greater than 0% and P-values less than 0.05).

### Table 1. Prevalence and trends of chromosomal abnormalities in Haidian District, Beijing, China, from 2013 to 2022 (N expressed as 1/10,000).

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Autosomal trisomies</td>
<td>19.18</td>
<td>16.96</td>
<td>20.22</td>
<td>19.71</td>
<td>25.08</td>
<td>23.94</td>
<td>30.34</td>
<td>31.19</td>
<td>29.44</td>
<td>29.67</td>
<td>7.5 (6.7, 9.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Trisomy 21 syndrome</td>
<td>15.20</td>
<td>13.24</td>
<td>14.62</td>
<td>14.67</td>
<td>18.01</td>
<td>15.77</td>
<td>22.61</td>
<td>23.49</td>
<td>20.57</td>
<td>23.40</td>
<td>6.9 (4.6, 9.2)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Trisomy 18 syndrome</td>
<td>3.51</td>
<td>3.31</td>
<td>4.63</td>
<td>4.35</td>
<td>5.93</td>
<td>7.04</td>
<td>4.87</td>
<td>6.16</td>
<td>7.66</td>
<td>5.85</td>
<td>8.2 (4.7, 11.9)</td>
<td>0.001</td>
</tr>
<tr>
<td>Trisomy 13 syndrome</td>
<td>0.47</td>
<td>0.41</td>
<td>0.97</td>
<td>0.69</td>
<td>1.14</td>
<td>1.13</td>
<td>2.86</td>
<td>1.54</td>
<td>1.21</td>
<td>1.21</td>
<td>0.001 (17.2, 23.2)</td>
<td>0.924</td>
</tr>
<tr>
<td>Sex chromosome aneuploidies</td>
<td>4.91</td>
<td>5.59</td>
<td>5.36</td>
<td>6.19</td>
<td>10.26</td>
<td>15.49</td>
<td>10.30</td>
<td>15.02</td>
<td>27.03</td>
<td>20.89</td>
<td>21.3 (15.9, 27.0)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Sex chromosome chromism</td>
<td>0.70</td>
<td>1.86</td>
<td>0.97</td>
<td>1.83</td>
<td>2.51</td>
<td>2.25</td>
<td>1.43</td>
<td>1.93</td>
<td>4.44</td>
<td>2.93</td>
<td>13.4 (5.5, 22.0)</td>
<td>0.004</td>
</tr>
<tr>
<td>47XXX</td>
<td>1.64</td>
<td>1.66</td>
<td>1.22</td>
<td>1.37</td>
<td>3.19</td>
<td>3.94</td>
<td>4.29</td>
<td>5.78</td>
<td>10.49</td>
<td>6.27</td>
<td>26.4 (18.0, 35.4)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>47XXY</td>
<td>0.47</td>
<td>0.41</td>
<td>0.49</td>
<td>0.92</td>
<td>0.91</td>
<td>1.97</td>
<td>0.86</td>
<td>1.54</td>
<td>3.63</td>
<td>2.58</td>
<td>25.8 (18.3, 33.3)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>47XXXX</td>
<td>0.47</td>
<td>0.62</td>
<td>0.49</td>
<td>0.46</td>
<td>1.14</td>
<td>3.38</td>
<td>2.58</td>
<td>1.54</td>
<td>2.82</td>
<td>1.67</td>
<td>22.6 (7.2, 40.1)</td>
<td>0.008</td>
</tr>
<tr>
<td>45X</td>
<td>1.64</td>
<td>1.03</td>
<td>1.71</td>
<td>1.15</td>
<td>1.37</td>
<td>2.82</td>
<td>1.14</td>
<td>1.23</td>
<td>1.61</td>
<td>2.93</td>
<td>6.6 (2.8, 10.5)</td>
<td>0.004</td>
</tr>
<tr>
<td>Other chromosomal abnormalities</td>
<td>5.38</td>
<td>6.20</td>
<td>5.85</td>
<td>7.34</td>
<td>11.18</td>
<td>11.82</td>
<td>18.03</td>
<td>22.74</td>
<td>25.40</td>
<td>35.10</td>
<td>22.6 (15.6, 30.1)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Microdeletion/microduplication</td>
<td>1.64</td>
<td>1.45</td>
<td>3.9</td>
<td>3.21</td>
<td>5.02</td>
<td>3.94</td>
<td>9.73</td>
<td>13.1</td>
<td>16.94</td>
<td>19.22</td>
<td>34.9 (29.3, 40.6)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Translocation</td>
<td>1.87</td>
<td>2.48</td>
<td>0.49</td>
<td>1.15</td>
<td>3.19</td>
<td>3.38</td>
<td>3.72</td>
<td>4.62</td>
<td>4.03</td>
<td>7.52</td>
<td>20.8 (6.7, 38.0)</td>
<td>0.012</td>
</tr>
<tr>
<td>Inversion</td>
<td>0.70</td>
<td>1.03</td>
<td>0.73</td>
<td>0.46</td>
<td>2.05</td>
<td>1.97</td>
<td>2.29</td>
<td>1.93</td>
<td>2.42</td>
<td>5.85</td>
<td>23.2 (11.6, 36.0)</td>
<td>0.001</td>
</tr>
<tr>
<td>Others</td>
<td>1.17</td>
<td>1.24</td>
<td>0.73</td>
<td>2.52</td>
<td>0.92</td>
<td>2.53</td>
<td>2.29</td>
<td>3.09</td>
<td>2.01</td>
<td>2.51</td>
<td>12.5 (7.0, 18.3)</td>
<td>0.001</td>
</tr>
<tr>
<td>Total</td>
<td>29.46</td>
<td>28.76</td>
<td>30.95</td>
<td>32.77</td>
<td>44.91</td>
<td>49.85</td>
<td>58.39</td>
<td>66.63</td>
<td>77.45</td>
<td>82.74</td>
<td>13.4 (8.3, 18.8)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Abbreviation: AAPC=average annual percent change; CI=confidence interval.
TABLE 2. Trends in the annual prevalence of chromosomal abnormalities in Haidian District, Beijing, China, from 2013 to 2022 using Joinpoint regression analysis.

<table>
<thead>
<tr>
<th>Segments*</th>
<th>Year</th>
<th>APC (95% CI)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trend 1</td>
<td>2013–2015</td>
<td>3.4 (−20.2, 33.9)</td>
<td>0.754</td>
</tr>
<tr>
<td>Trend 2</td>
<td>2015–2022</td>
<td>16.4 (13.5,19.5)</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Full range</td>
<td>2013–2022</td>
<td>13.4 (8.3,18.8)</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

Abbreviation: APC=annual percentage change; CI=confidence interval.
* The implementation of universal two-child policy was in 2016 and the application of noninvasive prenatal testing was 2017.

Table 2 illustrates an inflection point in CAs prevalence identified by Joinpoint regression modeling in 2015. The initial trend indicates an escalation in annual prevalence from 29.46/10,000 in 2013 to 30.95/10,000 in 2015 (APC=3.4%, 95% CI: −20.2%, 33.9%). The subsequent trend demonstrates a significant upsurge from 30.95/10,000 in 2015, escalating to 77.45/10,000 in 2022 (APC=16.4%, 95% CI: 13.5%, 19.5%).

Table 3 delineates the variation in characteristics of CAs across distinct periods. Among all CAs instances, significant increases from 2013–2015 to 2016–2022 were observed for maternal age (P<0.001), gravidity (P=0.002), parity (P<0.001), and prenatal diagnostics (P<0.001). For trisomy 21 syndrome cases specifically, disparate distributions in maternal age, parity, gestational weeks, prognosis, therapeutic abortion, and timing of diagnosis were evident across varying periods (all P<0.05). In SCAs scenarios, a marked increase in prenatal diagnostics was shown, from 87.7% in 2013–2015 to 98.9% in 2016–2022 (P<0.001). Furthermore, in cases involving microdeletion and microduplication, there was an observed augmentation in gravidity (P=0.020) and the rate of therapeutic abortion (P=0.026) during the period from 2013–2015 to 2016–2022.

DISCUSSION

Data derived from a hospital-based birth-defect surveillance system in Haidian District, Beijing indicates a steady increase in the prevalence of CAs over the past decade. The data further reveals a significant increase in the prevalence of most CAs subtypes from 2013 to 2022. Interestingly, the year 2015 marked a major turning point in this trend wherein the prevalence growth rate significantly escalated post-2015.

Globally, CAs occur in approximately 4 to 9 out of every thousand newborns (6). In the Haidian District of Beijing, the prevalence of CAs is relatively low, with 4.595 per thousand. It is important to mention, however, that this prevalence has seen a steady increase, reaching 8.274 per thousand in 2022. Due to regional differences in detection rates and capabilities, it would be inaccurate to directly compare the prevalence of CAs between different regions. Nonetheless, a similar increasing trend in prevalence, as seen in this study, has been reported in several prior studies. For instance, the prevalence of trisomy 21, trisomy 18, and trisomy 13 syndromes in Europe showed an escalation between 2005 and 2021 (3). In Zhejiang Province, the overall prevalence of CAs rose from 1.209 per thousand to 3.922 per thousand between 2014 and 2020, with varying degrees of increase in the prevalence of trisomy 21 syndrome, SCAs, and microdeletions/microduplications (4). Similarly, in Guangdong Province, the prevalence of trisomy 21 syndrome surged from 0.465 per thousand to 1.364 per thousand between 2011 and 2018 (7).

In our investigation, it was observed that the maternal age for children suffering from CAs during the period 2016–2022 was statistically higher compared to 2013–2015. This change coincided with China’s transition from a one-child to a universal two-child policy in 2016. As a result, there was a noticeable increase in the percentage of pregnancies associated with older mothers, multiple pregnancies, and multiparous women from 2016 to 2022 in contrast to the numbers recorded between 2013 and 2015. Earlier research determined that advanced maternal age significantly raises the risk for CAs (8). Consequently, it can be posited that the shift in birth policy may have indirectly increased maternal age, gravidity, and parity, thereby causing a surge in the prevalence of CAs post-2016 (9).

Conversely, the observed surge in reported cases of CAs might represent advancements in prenatal diagnostic methods in Haidian District and increased awareness among expectant mothers. The National Health Commission of the People’s Republic of China initiated a nationwide pilot program for this technology in 2016 and the NIPT technology was applied in 2017 in Beijing (10). Evidently, NIPT
TABLE 3. Variations in characteristics of chromosomal abnormality cases over select time periods in Haidian District, Beijing, China, n (%).

<table>
<thead>
<tr>
<th>Variable</th>
<th>Total CAs</th>
<th>Trisomy 21 syndrome</th>
<th>SCAs</th>
<th>Microdeletions/microduplications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>392</td>
<td>1,284</td>
<td>189</td>
<td>444</td>
</tr>
<tr>
<td>Age, years</td>
<td>&lt;0.001</td>
<td>0.006</td>
<td>0.077</td>
<td>0.054</td>
</tr>
<tr>
<td>≤30</td>
<td>113 (31.0)</td>
<td>265 (20.7)</td>
<td>45 (26.0)</td>
<td>67 (15.2)</td>
</tr>
<tr>
<td>30–35</td>
<td>124 (34.0)</td>
<td>456 (35.7)</td>
<td>54 (31.2)</td>
<td>148 (33.5)</td>
</tr>
<tr>
<td>&gt;35</td>
<td>128 (35.1)</td>
<td>557 (43.6)</td>
<td>74 (42.8)</td>
<td>227 (51.4)</td>
</tr>
<tr>
<td>Gravidity</td>
<td>0.002</td>
<td>0.065</td>
<td>0.211</td>
<td>0.020</td>
</tr>
<tr>
<td>1</td>
<td>154 (39.3)</td>
<td>399 (31.1)</td>
<td>73 (38.6)</td>
<td>138 (31.1)</td>
</tr>
<tr>
<td>≥2</td>
<td>238 (60.7)</td>
<td>885 (68.9)</td>
<td>116 (61.4)</td>
<td>306 (68.9)</td>
</tr>
<tr>
<td>Parity</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.100</td>
<td>0.745</td>
</tr>
<tr>
<td>Nulliparous</td>
<td>193 (49.2)</td>
<td>433 (34.5)</td>
<td>103 (54.5)</td>
<td>173 (39.0)</td>
</tr>
<tr>
<td>Multiparous</td>
<td>199 (50.8)</td>
<td>851 (66.3)</td>
<td>86 (45.5)</td>
<td>271 (61.0)</td>
</tr>
<tr>
<td>Gestational week</td>
<td>0.675</td>
<td>&lt;0.001</td>
<td>0.888</td>
<td>0.134</td>
</tr>
<tr>
<td>&lt;28</td>
<td>284 (72.4)</td>
<td>944 (73.5)</td>
<td>155 (82.0)</td>
<td>425 (95.7)</td>
</tr>
<tr>
<td>≥28</td>
<td>108 (27.6)</td>
<td>340 (26.5)</td>
<td>34 (18.0)</td>
<td>19 (4.3)</td>
</tr>
<tr>
<td>Number of embryos</td>
<td>0.291</td>
<td>0.997</td>
<td>0.778</td>
<td>0.656</td>
</tr>
<tr>
<td>Single birth</td>
<td>342 (94.0)</td>
<td>1,222 (95.3)</td>
<td>165 (95.9)</td>
<td>425 (95.9)</td>
</tr>
<tr>
<td>Multiple births</td>
<td>22 (6.0)</td>
<td>60 (4.7)</td>
<td>7 (4.1)</td>
<td>18 (4.1)</td>
</tr>
<tr>
<td>Prognosis</td>
<td>0.510†</td>
<td>&lt;0.001†</td>
<td>1.000†</td>
<td>1.000†</td>
</tr>
<tr>
<td>Live birth</td>
<td>88 (24.2)</td>
<td>273 (21.4)</td>
<td>26 (15.1)</td>
<td>10 (2.3)</td>
</tr>
<tr>
<td>Early fetus loss and stillbirths</td>
<td>274 (75.3)</td>
<td>998 (78.1)</td>
<td>146 (84.3)</td>
<td>432 (97.5)</td>
</tr>
<tr>
<td>Early neonatal deaths</td>
<td>2 (0.5)</td>
<td>7 (0.5)</td>
<td>1 (0.6)</td>
<td>1 (0.2)</td>
</tr>
<tr>
<td>Therapeutic abortion</td>
<td>0.270</td>
<td>&lt;0.001</td>
<td>0.774</td>
<td>0.026</td>
</tr>
<tr>
<td>No</td>
<td>93 (25.5)</td>
<td>292 (22.8)</td>
<td>27 (15.7)</td>
<td>14 (3.2)</td>
</tr>
<tr>
<td>Yes</td>
<td>271 (74.5)</td>
<td>990 (77.2)</td>
<td>145 (84.3)</td>
<td>429 (96.8)</td>
</tr>
<tr>
<td>Time of diagnosis</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>&lt;0.001</td>
<td>0.741</td>
</tr>
<tr>
<td>Prenatal</td>
<td>324 (89.0)</td>
<td>1,249 (97.4)</td>
<td>146 (84.9)</td>
<td>438 (98.9)</td>
</tr>
<tr>
<td>Postpartum</td>
<td>40 (11.0)</td>
<td>33 (2.6)</td>
<td>26 (15.1)</td>
<td>5 (1.1)</td>
</tr>
</tbody>
</table>

Abbreviation: CAs=chromosomal abnormalities; SCAs=sex chromosomal abnormalities.
† Differences between the 2013–2015 period and 2016–2022 period, as determined by Fisher’s exact test.
technology exhibits high performance in early
detection of CAs, managing to identify certain variants
of CAs that proved challenging via traditional
methods. Owing to its elevated sensitivity, the
prevalence of missed diagnosis prior to pregnancy is
minimized, which may partially account for the rising
prevalence of CAs noted in this study.

The NIPT not only enhances the efficacy of
detection for autosomal trisomies, but also proves
useful in identifying certain types of SCAs, such as 47
XY and 47 XXY, and other CAs (4). Ethical
considerations necessitate that any decision to proceed
with therapeutic abortion for CAs must fully respect
the patient’s wishes. Therefore, healthcare practitioners
need to deliver individualized and detailed genetic
counseling based on the detection information. For
severe cases like trisomy 21 syndrome, healthcare
practitioners may provide conclusive advice allowing
the patient to consider therapeutic abortion before the
28 weeks gestation mark. However, certain CAs such
as some SCAs subtypes and structural CAs are neither
fatal nor severely debilitating. Here, practitioners’
advice should take into account a variety of factors
such as prognosis, the patient’s physical condition, and
financial capabilities. The final decision rests with the
patient whether to proceed with abortion or explore
different interventions. Limited counselling or
insufficient explanation can lead to unnecessary
abortions resulting in unwarranted intervention. The
exemplary detection capacity of NIPT has led to an
upick in the proportion of hitherto rare SCAs and
other CAs, posing fresh challenges for genetic
counselling and healthcare practitioners.

Our findings indicate that the SCA abortion rate did
not considerably rise post-2016, an encouraging sign.
However, it is crucial to note that the abortion rate for
microdeletion/microduplication was higher between
2016–2022 compared to 2013–2015. Looking ahead,
the focus must be on increasing awareness and
education among expectant women for a proper
understanding. Healthcare practitioners must also
strive for accurate interpretation and evaluation of test
information, to aid patients in making appropriate
treatment decisions in light of the varying prognoses
associated with CAs.

The present study possesses several notable
strengths. Primarily, Haidian District boasts a 100%
rate of hospital-based delivery, making the district’s
hospital surveillance data an accurate representation
of the population. Secondary strength lies in the district’s
high level of medical care, coupled with the established
diagnostic proficiency of affiliated midwifery
organizations. The deployed surveillance system, with
its extensive review and rejection mechanisms for
diagnostic results, bolsters data reliability at both the
district and municipal levels. Moreover, the
classification of CAs within the surveillance system —
trisomy 21, trisomy 18, trisomy 13 syndrome, SCAs,
and other CAs — was subdivided into more precise
subtypes. This allows for a more nuanced analysis of
CAs prevalence and also aids in enhancing future
classification systems.

This study encompasses several limitations.
Primarily, as a regional observational research, the
findings are specifically indicative of the urban region
in Beijing and may not be comprehensively
representative of either the complete Beijing populace,
or China overall. Additionally, the study did not
incorporate an exhaustive categorization of structural
CAs. Lastly, certain data categories such as specific
exposure factors were omitted from collection in this
research, limiting the study’s scope to merely detailing
the distribution of CAs rather than identifying
potential risk factors.

The prevalence of CAs in Haidian, Beijing, has
markedly risen from 2013 to 2022. This increase may
be ostensibly linked to a rise in advanced maternal age
and the utilization of NIPT. Heightened detection
rates of CAs can expedite treatment for pregnant
women diagnosed with poor prognosis conditions such
as trisomy 21 syndrome, thus alleviating their burden.
Conversely, attention must also be accorded to other
CAs, such as SCAs, and women should be educated to
form an accurate comprehension of these conditions.
Achieving this requires healthcare practitioners to
possess a comprehensive understanding of the
advantages and disadvantages of prenatal diagnostic
methods, patient preferences, and ethical evaluations.

Conflicts of interest: No conflicts of interest.

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