INTISARI

Deteksi osteoporosis dapat dilakukan menggunakan pengamatan visual dan pengukuran manual pada radiograf panoramik. Deteksi manual menunjukkan kesesuaian dengan hasil pemeriksaan *Dual X-ray Absorptiometry* (DEXA), namun ditemukan kelemahan pada hasil interpretasi seperti subjektivitas dan rentang waktu yang lama. Oleh karena itu, deteksi osteoporosis menggunakan radiografi panoramik dari manual berkembang menjadi otomatis dengan tujuan membantu memperbaiki akurasi dan efisiensi dalam deteksi osteoporosis. Pemanfaatan *artificial intelligence* (AI) untuk deteksi osteoporosis pada radiograf panoramik telah dikembangkan. Ketepatan sebuah algoritma dalam mendeteksi osteoporosis dapat diketahui dari performa masing-masing AI. Performa AI diukur melalui sensitivitas, spesifitas, dan akurasi.

Review dilakukan dengan mencari literatur dari tiga *database* yang dapat diakses melalui *electronic resources (e-resources)* antara lain Google Scholar, ScienceDirect, dan PubMed. Pencarian literatur menggunakan kata kunci osteoporosis, *orthopantomograph*, *dental panoramic radiograph*, *automatic,* dan *automatic detection*. Pencarian literatur dibatasi oleh kriteria inklusi berupa tahun terbit 2014 hingga 2023 yang menggunakan bahasa Indonesia atau bahasa Inggris.

Hasil *review* terhadap 12 artikel utama menunjukkan bahwa performa diagnostik AI untuk deteksi osteoporosis pada radiograf panoramik menunjukkan hasil yang hampir menyerupai diagnosis osteoporosis berdasarkan DEXA, dilihat dengan nilai sensitivitas, spesifisitas, dan akurasi masing-masing AI mencapai 48,6-100%, 26,3-100%, dan 53,9-99,3%. Pencapaian performa diagnostik yang optimal perlu memperhatikan karakteristik sampel, *region of interest* (RoI), fitur, dan algoritma yang digunakan. Pengembangan AI sebagai alat diagnostik osteoporosis pada radiograf panoramik menunjukkan potensi yang besar pada masa mendatang dan memerlukan perhatian yang cermat serta kerjasama secara berkelanjutan lintas bidang antara klinisi dan ahli komputasi.

Kata Kunci : osteoporosis, diagnosis, radiograf panoramik, *artificial intelligence*, performa

ABSTRACT

Osteoporosis detection can be done using visual observation and manual measurements on panoramic radiographs. The manual detection has shown alignment with Dual X-ray Absorptiometry (DEXA) examination results. However, weaknesses were found in the interpretation results, such as subjectivity and time-consuming. Therefore, the application of panoramic radiography has been developed into an automated system to assist in improving the accuracy and efficiency of osteoporosis detection. The utilization of artificial intelligence (AI) in osteoporosis detection on panoramic radiographs has been developed. The accuracy of an algorithm in osteoporosis detection can be determined by their respective performance. Performance is measured through sensitivity, specificity, and accuracy.

A review was conducted by searching literature from three electronic resource databases, namely Google Scholar, ScienceDirect, and PubMed. The literature was searched using keywords such as osteoporosis, orthopantomograph, dental panoramic radiograph, automatic, and automatic detection. The literature search was limited by inclusion criteria of publications from 2014 to 2023 in either Indonesian or English language.

The results of the review of 12 main articles showed that the diagnostic performance of AI for osteoporosis detection on panoramic radiographs showed results that were almost similar to the diagnosis of osteoporosis based on DEXA, as seen from the sensitivity, specificity, and accuracy values ranging from 48,6-100%, 26,3-100%, and 53,9-99,3% respectively. Achieving optimal diagnostic performance requires attention to sample characteristics, region of interest (RoI), features, and algorithms used. The development of AI as a diagnostic tool for osteoporosis on panoramic radiographs shows great potential in the future and requires careful attention and sustainable multidiscipline collaboration between clinicians and computational experts.

Keywords   : osteoporosis, diagnosis, panoramic radiograph, artificial intelligence, performance