Addressing disparities in cancer care: The role of multidisciplinary teams in Malaysia

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Track: Research
Theme: Treatment

ABSTRACT

Cancer is recognized as a predominant cause of global death and remains a significant global public health challenge. Dasatinib, a tyrosine kinase inhibitor (TKI), is primarily indicated for the treatment of Philadelphia chromosome-positive (Ph+) chronic myeloid leukemia (CML) in adults and children, has recently undergone extensive research on other types of solid tumour cancers, such as prostate cancer, breast cancer, glioma, lung cancer, colorectal cancer, and pancreatic cancer. Nonetheless, its clinical application is limited by poor aqueous solubility, reduced oral bioavailability, and significant elimination occurs via CYP3A4-mediated metabolism, leading to a shorter half-life of 3–4 hours. Integrating dasatinib (DAS) into lyotropic liquid crystalline nanoparticles (LLCN) presents a promising approach to addressing these limitations by enhancing the drug's solubility, safeguarding against degradation, and facilitating targeted delivery to cancer cells. Emerging evidence shows that the size of drug-loaded LLCN is a key factor in achieving clinical success. Modern techniques for fabricating LLCN can result in nanoparticles of different sizes, but they can't precisely control particle size. Hence, a microfluidic system will be used as it offers a simplified, reproducible, scalable, and accelerated process of nanomedicine development through a one-step single mixing process. The lipid, surfactant, and drug concentration were studied on their effect on the LLCN's particle size, along with the crucial parameters, such as microfluidic chip design, total flow rate, and flow rate ratio, on the preparation of LLCN were investigated using the evidence-based quality-by-design strategy. The mean LLCN particle size produced was 131.8 ± 1.9 nm (n=3), with its polydispersity index less than 0.3, and its zeta potential at -11.0 ± 0.9 mV (n=3). The study is progressing toward achieving a drug encapsulation efficiency exceeding 75%, with in vitro cell-based evaluations planned to assess cellular uptake and therapeutic potential.

Keywords: lyotropic liquid crystalline nanoparticle, microfluidic, Dasatinib, tyrosine kinase inhibitor