guidelines are unavailable and scaling-up is also prevailing challenge [174]. Though, it has been envisioned that with passing time, expiring of patents and market loss, the pharmaceutical companies will take shift towards the manufacturing of nanocarrier drug to compete constructively. These advancements will further demand the improvement in regulation guidelines according for pharmacokinetic and physicochemical properties of nanocarrier drug as they differ from other traditional drugs [175]. For this, EMA and FDA have taken the initiative to recognize few potential scientific and regulatory challenges. Additionally, International Organization for Standardization has established technical committee, those who will deal in the field of nanotechnologies to extend standards related to their terminology, nomenclature, characterization, measurement, health benefits and safety in comparison with other standards. And, these standards are still under progress [176].

Furthermore, progress in R&D related to nanocarrier drug delivery system has raised the concern about the safety of this nanomaterial in our human body. As few of the nanomaterial synthesized are biodegradable whereas few are not, in some cases, the by-product formed also becomes the reason of concern (D. [177]). For example, material used on macroscale was found to be safe but that same material was found to be toxic, as the physicochemical characteristic of that material gets altered at the nanoscale. The safety parameter for these nanomaterials should not be only limited to their effect on patient population but should also involve complete manufacturing as well as disposal processes [178].

In addition to the above context, traditional safety measures used in pharmaceutical industries are not valid for developing and manufacturing nanomaterial. Instead, they demand for extra precautions in order to safeguard the environment from the negative impact of these nanomaterials [179]. Though the progress in the nanotechnology has reduced the development cost but only few materials are still being produced in bulk, which are also doubtful as if they will be commercial successful or expensive technology [180].

6. FUTURE DIRECTIONS

In the past decades, nanomedicine has developed into fascinating area for research. In the last two decades, around 1500 patent from research in this field has been filed and out of which few of them are on edge of completion of clinical trials. As summarized in the above table, lung cancer appears to be suitable example, where this controlled drug delivery approach has served the both diagnostic and therapeutic purposes. With the aid of different type of nanocarriers system have been developed to deliver the specific amount of therapeutic agent to the affected cell, without affecting the normal cell, show the potential of nanocarrier-drug delivery system. As it is becoming the trend and will remain in the nearby future in the arena of research. Hence the expedition concerning the consistency, drug loading capacity, releasing capacity and uniformity would serve for the future prospect in this field of research. Significant developments of different nanocarrier system for drug delivery have been comprehended in this chapter.

Despite being a deep understanding of the future outlook of nano-drug delivery system and nanomedicine, its real application in the healthcare sector, even in cancer diagnosis/therapy is very restricted. It has been only two decades since the introduction of this field of science and which has brought the paradigm shift in this research area but still many central attributes remain unknown. One of the chief features of this research is to explore fundamental markers related to chronic disease, so that targeted treatment could be done without amending the normal biological processes. Eventually, this field of nanomedicine will improve our knowledge about chronic diseases up to the molecular level and identification of biomarkers will unveil new opportunities for developing new diagnosis or therapeutic methods. Therefore, profound knowledge about the molecular signature of chronic disease improves the application of nanomedicine in the nearby future. However, the different types of nanocarrier systems for controlled drug delivery have been comprehended, whereas further exploration in this field will open new avenues in nanomedicine.

The idea of controlled release of particular drug at targeted site, the method for analyzing these events, effect of drug at cellular/tissue level, and mathematical model for predicting are still in their development stage. Various nanomedicine studies are just focusing on the formulation and type of biomaterial, which appears to be the foundation stone of nanomedicine application. Multidisciplinary research and animal trials can play a significant role in collecting valuable data for diagnosis and therapeutic potential of nanocarriers for delivering the therapeutic drug, but it demands for both resources and time. On seeing the global trend and development of more advance diagnosis method and personalized medicine, the scope of targeted nanomedicine and nanodrug delivery method looks unparallel.

The extensive research is being conducted to develop nanorobots that could be used for diagnosis purposes