International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 408-414 www.ijprajournal.com ISSN: 2456-4494

Mini Tablet

Mr. Omkar M. Lakhotiya[1*] Prof. Santosh Waghmare[2] Prof. A. T. Shinde[3]Mr.Shrikrushna C. Bharat[4]

[1*, 2, 3, 4] *Department of Pharmaceutics, Loknete Shri DadapatilPharate College of Pharmacy, MandavganPharata, Tal- Shirur Dist.- Pune Maharashtra, India.*

Submitted: 01-03-2022 Accepted: 15-03-2022

ABSTRACT

Controlled drug delivery systems are designed to deliver medicine over a long length of time or for a set amount of time during therapy. Single unit dose forms (SUDFs) and multiple-unit dosage forms (MUDFs) are two types of oral controlled release medication delivery systems (MUDFs). Pellets, granules, and mini tablets are examples of multiple unit dose forms.

Among Mini tablets, like all MUDFs, represent a new trend in solid dosage form design, with the primary goal of overcoming medication excipients or drug-drug interactions. Interactions between drugs Because of their relative ease of manufacturing and dose, they are also a viable alternative to pellets and granules. It is possible to generate forms of equal size, weight, and a smooth, regular surface in a repeatable and continuous manner.

They don't need any solvent to make them, thus stability issues can be avoided; they also require less coating material and offer a lot of freedom in formulation creation. The focus of this evaluation is on several elements of small tablets.

I. INTRODUCTION

Among all medication delivery systems, the oral drug delivery system is the most popular and convenient. Oral medicine is sometimes regarded as the most important scene. investigated in the discovery and advancement of new medicine elements and pharmaceutical plans, primarily due to patient acceptance and convenience in administration, and the real putting together procedure For certain medications, and traditional immediate-release medications While formulations provide clinically effective treatment, maintaining the essential pharmacokinetic and pharmacodynamic balance pharmacodynamic profiles with a size that is acceptable to the patient's safety When it comes to controlled-release systems, The most popular method of administration is oral. consideration. The goal of any dosage type is to keep the patient healthy. by delivering a therapeutic dose of medication to a specified spot.

There are two types of oral controlled release drug delivery frameworks available: SUDFs (Single Unit Dosage Forms) - capsules and tablets; MUDFs (Multiple Unit Dosage Forms)

Mini tablets, granules, and pellets (MUDFs).

The concept of MUDFs was first established in 1950. Multiple unit dose forms have desirable features made up of small discrete units. The arrival of a medicament is controlled by MUDFs. as seen by the medication release's repeatability profiles as compared to those obtained using SUDFs These MUDFs are depicted by the way the dose is administered. governed as a number of subunits, each with its own set of rules drug. The entire amount of the general dose is then calculated. medication in each subunit and the total dose's usefulness is genuinely associated with the individual's utility subunits. The concept of MUDFs is advantageous when the selected operators have multiple mechanisms of action that have a synergistic or additive effect, reducing the amount of effort required. SUDFs have a lower dose than SUDFs. Following disintegration, a variety of units are released into the stomach and distributed throughout the digestive tract gastrointestinal system, resulting in consistent medication release with a lower risk of neighbouring disturbance MUDFs than a thick gelatin capsule containing numerous tiny pills After the breakdown, it is compacted into larger tablets and released. subunits in a variety of dosage forms MUDFs usually eat a lot of food. When compared to SUDFs, it has a more consistent in-vivo dissolving profile, resulting in more uniform bioavailability. MUDFs have many advantages over other types of funds. monolithic dosage forms are the most common type of dosage form. MUDFs may arise. in the short term, to be more expensive than SUDFs; nevertheless, due to, less opposition is

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 408-414 www.ijprajournal.com ISSN: 2456-4494

being formed, and more Gastric emptying is expected, thus therapy is reduced. a higher rate of disillusionment and a longer colonic stay as a result of this, there are a lot of investment funds.

1.1 Definition, properties

Mini tablets are tablets with diameters ≤ 3 mm and have a wide application area For ease of use, they are usually filled in capsules, or they can be compressed into larger tablets or filled into sachets. Mini tablets are produced with multiple punches using eccentric or rotary tablet press machines. Thanks to easy production techniques, mini-tablets can be produced in a certain size and dosage. The variability between series is also low. Apart from productivity, the use of multiple punches in their production increases the amount of dust that can be consumed at a time. Thus, the fill time is shortening. In consequence of the short waiting time, the separation of the powders is Prevention

1.2 Benefits of multiple punches:

• Increase productivity,
• Does not require different production equipment, only mould cost,
• Shorten the working time,
• No separate equipment is required to collect the products obtained.
• Cost is low due to all these features.

Multiple punches are often used as multi-piece assemblies or as monoblocks. There are two varieties, one internal cap fixing and the other external cap fixing. The internal fixing pins are immobilized into the punch body. Mounting and disassembly of them are easy and they have fewer pins compared to external cap fixing. The risk of contamination of the product in multi-piece punches is low. However, parts need to be separated before they are cleaned. Monoblock punches require less installation time and are easier.

While multiple punches are resistant to breakage and abrasion, monoblocks are more resistant. However, the eroded edges of multiple punches can be replaced without having to change the punches. If these types of punches are not installed carefully, they can be eroded or damaged during use. They are also nondurable to non-axial stresses due to the high length/diameter ratio of the punch tips. For this reason, the length/diameter ratios and the speed of the device have to be adjusted well. Compared to conventional tablets, mini-tablets need lower pressures. A single punch having 2-3 mm diameter is durable and can take up to 2-3 kN axial force. For this reason, the process must be started with low-pressure values.

II. FORMULATION OPTIONS OF MINI TABLET DOSAGE FORMS

• Compressed mini tablets
• Encapsulated mini tablets
• Biphasic drug delivery system prepared as a mini-tablet

2.1 Compressed mini tablets

To avoid the cost of hard gelatin capsules, mini-tablets can be formulated as tablets. Uniform sizes, smooth shapes, smooth surfaces, low porosity and high mechanical resistance make them more uniform and reproducible tablets than pellets and granules. Depending on the properties of the external phase that provides the filling of the cavity (hydrophobic/hydrophilic polymer matrix used and the number of mini-tablets), the release profile can be changed. Biphasic drug delivery systems are developed using different release characteristics. In these systems, one phase initiates the rapid action by providing the immediate release while the other phase releases the long-term effect, ensuring continuity of efficacy and eliminating the need for recurrent doses of the drug.

2.2 Biphasic drug delivery system

To reduce the cost of the product, mini-tablets can be compressed as a larger tablet instead of filling in a capsule. Dimensional uniformity maintains its form and shape thanks to smooth shapes, smooth surfaces, low porosities and high resistance to forces. Thus, it is more advantageous than pellets and granules. In biphasic drug delivery systems, the rapid release period and the long release period of the drug are combined. The rapid release compartment provides a jump effect at the beginning, while the slow release compartment allows the drug effect to continue at a constant rate for a certain period. Also, the desired dosage regimen can be provided by changing the number of mini-tablets providing extended-release and the dosage of the drug in the immediate release component. Biphasic systems can be designed to be fast/slow as well as slow/fast The relationship between the amount of powder that will surround the mini tablets and the weight of the mini-tablets is important. It has been determined that the ratio between the amount of powder and the weight of the mini-tablet should be at least 3/1. Fewer amounts of powder are insufficient to fill the gap

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 408-414 www.ijprajournal.com ISSN: 2456-4494

between the mini tablets and fracture may appear on the tablets after compressing.

III. COATING TABLET

Fig.1 Coating Tablet

Coating of tablets is a separate formulation, is a separate production step and increases cost. For this reason, there are some requirements for a tablet coating.

- Mask bad taste and smell,
- Change the colour of the drug,
- İncrease physical and chemical stability,
- Control the release of the drug,
- Protecting the digestive enzyme in the gastrointestinal tract,
- İmprove the appearance of the drug,
- Make an identity

The coating is the last critical step in tablet production. The industry usually uses four coating processes:

- Sugarcoating
- Film coating
- Coating with pressure
- Enteric coating

The selection of the coating process depends on the type of coating material, the strength of the core tablet to covering material and the application process. Due to the high surface area/volume ratio in mini tablets, it may be difficult to control the release with matrix systems. Mohamed et al. examined the effect of theophylline-containing mini matrix tablets and non-matrix tablets by coating films with ethyl cellulose at different ratios. The results of the study showed that release in mini matrix tablets containing high soluble active substances can be achieved with the appropriate amount of film coating.

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 408-414 www.ijprajournal.com ISSN: 2456-4494

IV. MINI TABLET

Fig.2. Mini Tablets

Mini tablets are small dose forms that can be made using typical tabletting techniques including direct compression. The size of mini-tablets has been defined in many ways in the literature. Mini-tablets, for example, have dimensions of 2–3 mm or less, according to Lennartz and Mielck, although Thomson etc. Kachrimanis et al. employed dies with diameters of 2–4 mm to examine the flow of excipients via orifices important to mini-tabletting and characterised their size as 2–5 mm in diameter. Tablets with a diameter of less than 2 mm were referred to by Flemming and Mielck, albeit the latter used the term micro tablets to denote the minuscule sub-units.

The creation of mini-matrices using a tabletting approach is an appealing alternative to pellet production because solvents (e.g. water) are avoided and high production yields are produced, similar to those seen in extrusion and spheronization. Furthermore, the manufacturing technique allows for the production of predetermined sizes and strengths with little variation within and between batches. Single unit dose forms (SUDFs) are common in matrix tablets, however, multiple unit dosage forms (MUDFs) have different advantages over SUDFs.Coated pellets, beads, granules, and mini-tablets are commonly found in MUDFs, which are packaged in hard gelatin capsules. MUDFs are more expensive than SUDFs due to technological processes in production. Mini-matrices were created to combine the physiological benefits of MUDFs with the economic benefits.

Several mini-tablets can be put into hard capsules or compacted into larger tablets that, following disintegration, release these subunits as multiple dosage forms, just like other MUDFs. mini tablets are also known as "Micro Tablets." Mini tablets have the potential to be a breakthrough formulation for oral medication administration in children. Mini tablets provide several advantages over orally administered liquids in paediatrics, including the ability to deliver a precise dose without any modification before administration and the ability to dose flexibility (for varied patient ages and weights) by administering numerous mini tablets.

- **Advantages**

1. They are relatively simple to produce.
2. They have a consistent size, a regular shape, and a smooth surface.
3. They provide a substrate that is simple to coat with polymeric membranes to modify release.
4. They combine the benefits of MUDFs with well-established tabletting manufacturing techniques and have fewer constraints than extrusion/spheronization.
5. Mini tablets are an alternative to pellets due to their relative ease of manufacture and the ability to produce dosage forms of equal dimensions and weight with a smooth regular surface in a consistent and repeatable manner.
6. They provide high drug loading, a wide range of release rate designs, and release rate fine-tuning.

V. MINI TABLET COMPONENTS

Various mini-tablets can be prepared and constructed independently, then amalgamated into a capsule to release the medicine at predetermined times. quantities and in specified locations Various configurations of Mini-tablets come in three varieties: delayed-release, controlled release, and immediate release. formulations for immediate release Similarly, integrating Unsuitable

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 408-414 www.ijprajournal.com ISSN: 2456-4494

medications can be directed using particular mini-tablets in combination. As a result, disorders with identical symptoms can develop. The therapeutic area is effectively expanded when it is preserved. consequence.

VI. TYPE OF MINI-TABLETS

Enteric coating is a barrier that is added to oral medications to regulate where they are absorbed in the digestive tract. Most enteric coatings work by presenting a surface that is stable at the stomach's extremely acidic pH but breaks down quickly at a less acidic (slightly more basic) pH. They won't dissolve in the stomach's acidic contents (pH 3), but they will in the alkaline (pH 7-9) environment of the small intestine. Fatty acids, waxes, shellac, polymers, and plant fibres are among the materials utilised in enteric coatings. Drugs that irritate the stomach, like aspirin, can be coated with a material that only dissolves in the small intestine. Acid-activated azoles (esomeprazole, omeprazole, pan, and all grouped azoles) are acid-activated as well. Enteric coating applied to the formulation tends to prevent activation in the mouth and oesophagus for these sorts of medicines. Some businesses have recently started using enteric coatings on fish oil (omega-3 fatty acids) supplements. The coating protects the fish oil capsules from being digested in the stomach, which has been linked to fishy reflux in the past (fish burps). The abbreviation "EC" is sometimes added to the drug's name to signify that it has an enteric coating.

Mini tablets can be classified based on the target site, method of manufacturing, a patient needs as follows:

1. Pediatric mini tablets.
2. Oral disintegrating minitablets.
3. Gastro retentive min tablets.
4. Bio-adhesive mini tablets.
5. Biphasic mini tablets.

6.1.Pediatric mini tablets -

For children, syrups, pills, and capsules are regularly utilised dosage forms. Syrups are liquid dosage forms that are easy to administer and can easily be adjusted to meet the needs of the patient. However, chemical, physical, and microbial instability, taste issues, lack of controlled release, and formulation issues are all disadvantages of these liquid dosage forms. Tablets are difficult to swallow because of their large size, and dose modification is difficult. We sometimes have to break the tablets and administer them, which results in the tablets losing their activity. The traditional dosage forms also have a problem with patient compliance. Formulating small pills to address all of the aforementioned difficulties can result in high patient acceptance. Children accept little tablets more readily than larger tablets. other dosage forms like tablets, syrups, capsules, etc.

6.2 . Oral disintegrating minitablets-

Oral Dispersible Tablets (ODTs) are also known as "quick dissolve," "quick-dissolve," "crunch-melt," "bite-dispersible," "mouth-dissolve," and "orodispersible" tablets. Because of their small size, pleasant tongue feel, and quick disintegration in the mouth, oral dispersible mini-tablets (ODMTs) are better suited for paediatric patients. The ODT should have the following characteristics: they should dissolve in the mouth without the use of additional water. The destroyed tablet should dissolve into a soft paste or liquid suspension that has a pleasant tongue feel and is easy to swallow. The medicine will be partially dissolved close to the taste buds since ODTs dissolve or disintegrate in the patient's mouth. When it comes to patient acceptability, a nice taste in the mouth is crucial. Flavour masking isn't necessary unless the medicine is tasteless or doesn't have an unpleasant taste.

6.3. Gastro retentive min tablets or Floating mini tablets -

Gastro retentive micro pills are designed to keep the medicine in the stomach for a longer time. For tablets to float on the contents of the GI fluids, we usually include gas-producing agents in their formulation. When these tablets come into contact with food, they produce CO2, which is trapped in a swellable hydrocolloid, causing the tablet to float and remain in the stomach. Drug loading is low in single-unit tablets because the polymer utilised for floating is high. To improve medication loading in tiny tablets, coating with sodium bicarbonate or calcium carbonate (gas generating agents) or eudragits coating might be employed instead of swellable polymers in the formulation. Coating tiny tablets with a fluid bed processor are possible.

6.4. Bio-adhesive mini Tablets -

stomach for an extended time For tablets to float on the contents of the GI fluids, we usually include gas-producing agents in their formulation. When these tablets come into contact with food, they produce CO2, which is trapped in a swellable

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 408-414 www.ijprajournal.com ISSN: 2456-4494

hydrocolloid, causing the tablet to float and remain in the stomach. Drug loading is low in single-unit tablets because the polymer utilised for floating is high. To improve medication loading in tiny tablets, coating with sodium bicarbonate or calcium carbonate (gas generating agents) or eudragits coating might be employed instead of swellable polymers in the formulation. Coating tiny tablets with a fluid bed processor are possible. Levodopa floating micro pills with a prolonged release has been produced by Goole et al. They used 3mm in this case. mini tablets core formulated with a gas generating agent and coated the core with eduragi to get the required release.

VII. METHOD OF MANUFACTURING MINI TABLETS -

The methods that can be used for the manufacturing of mini-tablets are

1. Direct Compression
2. Wet Granulation
3. Dry Granulation
4. Melt-extrusion

7.1 Direct Compression -

The method of compressing tablets straight from powder mixes comprising API and excipients into biconvex micro tablets is known as compression. To achieve the desired hardness, direct compression grade excipients are utilised. When compared to tablets made via wet granulation, there are fewer stability issues.

7.2. Wet Granulation -

Wet granulation is the process of forming granules from a binder solution, which are subsequently crushed in a compression machine to make micro tablets. As a binding agent, polyvinyl pyrrolidone of various grades is commonly utilised.

7.3. Dry Granulation -

The reasonable technique of choice for the manufacturing of tablets containing temperature labile and moisture-sensitive medicines is dry granulation. This method makes use of a roller compactor or chilsonator, which is a type of processing equipment. Under intense pressure, this machine compresses premixed powders between two counter spinning rollers. Depending on the configuration of the roller, the produced material takes the form of a brittle ribbon, sheet, or piece. The compressed material is reduced to the appropriate size to produce granules, which are then combined with other inactive excipients before being compacted on a rotary compression machine.

7.4. Melt-extrusion -

The powder (API+ excipients) was premixed using this procedure, and the premixed powder was then transferred to the melt-extruder. In a melt-extruder, parameters such as screw speed, feed rate, and temperature are set in the range of the material's melting point. Following the extrusion process, the extrudates are ground and sieved. Using a compression machine, the resultant granules are compressed into small tablets.

Enteric coating polymers are commonly applied to mini-tablets in a fluid bed coater or customised coating pans17. Enteric coating is a polymer barrier that shields a medicine from the acidic pH of the stomach while allowing it to be released into the alkaline environment of the small intestine. That is, they will not dissolve in the stomach's acidic liquids but will break down in the alkaline environment of the small intestine. Fatty acids, waxes, phthalates, shellac, polymers, and plant fibres are the most common materials utilised in enteric coatings.

VIII. CONCLUSION -

Pharmaceutical mini pills offer various advantages over single unit dosage forms, according to this assessment. It is reasonable to believe that the medication dose will be precise. patients to increase efficiency Alternatives include little tablets. When compared to single-unit dosage, pellets and granules are superior. Production considerations, on the other hand, must be properly considered. inspected to ensure a smooth, complete, and accurate flow Filling the die and dismantling the device are both done locally.

The use of mini-doses can help to reduce irritation and dose dumping tablets. If you're taking a drug that has a low absorption rate, Small intestine micro tablet dose forms are beneficial since they can be taken orally. Without considerable effort, pass through the duodenum without any obstructions. Intestinal motility and gastric emptying Mini bioadhesive Compared to single unit bioadhesive tablets, tablets have better bio adherence and effect. In comparison to single unit dose forms, they are appropriate for children and geriatric patients, and they are also good substitutes for pellets and granules.

International Journal of Pharmaceutical Research and Applications
Volume 7, Issue 2 Mar-Apr 2022, pp: 408-414 www.ijprajournal.com ISSN: 2456-4494

REFERENCE -

[1]. Multiple Unit Dosage Forms: A Review, Bhavik Solanki, Rutvik Patel, BhaveshBarot, PunitParejiya, PragnaShelat, Pharmtechmedica.2012; 1(1):11-21.

[2]. Shoaib Mohammad Syed, R P Marathe, SR Shahi, V K Mourya, Mini-Tablet: A Review, Advances in Bioresearch Adv, Biores. 2006; Vol 7 (2): 05-10; Shoaib Mohammad Syed, R P Marathe, R P Marathe, R P Marathe, R P Marathe, R P Marathe, R P Marathe, R P Marathe.

[3]. Ghebre-Sellasie I, Marcel Dekker, Drugs and Pharmaceutical Sciences, 1994; 65: 307-312.

[4]. Mounika, B. Sirisha, and V. Uma Maheshwar Rao, Pharmaceutical Mini tablets, their advantages, and various enteric coating processes, World Journal of Pharmacy and Pharmaceutical Sciences, Volume 4, Issue 08, 523-541.

[5]. Fast dissolving tablets: a promising technique to drug delivery, Chauhan V, Kumar K, Teotia D. 2017; 2(4):58-64 in Univ J Pharm Res.

[6]. Garg D, Saini V, Gupta S, Kapoor DN, Joshi L. [16] Garg D, Saini V, Gupta S, Kapoor DN, Joshi L.Multiple-unit doses with controlled release and single-unit doses review of the literature Dhr is an international publication that publishes articles on a variety of topics. 4(2):66-73 in Pharmaceutical Sciences, 2013.

[7]. P. Borgquist, P. Nevsten, B. Nilsson, L. R. Wallenberg, and A. Axelsson. Single pellet and dose release trials verified the simulation of a multiparticulate system's release. J Control Release, vol. 97, no. 4, pp. 453–465.

[8]. Carla Lopes M, Jose Manuel Souza Lobo, Jaao Pinto F, Paulo, Costa, Carla Lopes M, Jose Manuel Souza Lobo, Jose Manuel Souza Lobo, Jose Manuel Souza Lobo, Jose Manuel Souza Lobo, Jose Manuel As a biphasic delivery technique, compressed mini-tablets are used. 323: 93-100 in International Journal of Pharmacology, 2006.

[9]. KamleshDashora, ShailendraSaraf, and SwarnalataSaraf are members of the Saraf family. Diclofenac Sodium and Tizanidine Hydrochloride Sustained-Release Multi-Component Microparticulate System Development Int J Pharm Sci Nanotech, 1(1), 97-105, 2008. BG Desai, HN Shivakumar, Sarosija Suresh Design and assessment of PH sensitive Mini-tablets for theophylline chronotherapeutic administration. 73-79 in Indian Journal of Pharmaceutical Sciences, 2007.

[10]. Pathak S, Suresh H. Chronopharmaceutics. Biorhythms are playing an increasingly important role in drug optimization.67(2): 135-140 in Indian Journal of Pharmaceutical Sciences, 2005.

[11]. M.H. Smolensky and A.N. Peppar. Drug delivery and chronopharmaceutics in chronobiology. 2007; Adv Drug Del 59: 825-851.

[12]. WIM HrasheskyThe Science 1994:32-37 says that timing is everything.

[13]. Y. Ozekia, M. Andoa, Y. Watanabea, and K. Danjob (2004) Novel one-step dry-coated tablets are being tested as a basis for delayed-release tablets. J ControlRelease, vol. 95, no. 6012, pp. 51–6012.

[14]. Bodakdev Ahmedabad, Patel P (2019). 16 May 2019, US Patent 20190142755.

[15]. R. Pawar, M. Jaimini, B. S. Chauhan, and S. K. Sharma (2014) A review of compression-coated tablets as a drug delivery mechanism (tablet in tablet). 6(1):21–3314 in the International Journal of Pharmaceutical Research and Development.

[16]. R. Shah, S. Patel, H. Patel, S. Pandey, and S. Shah (2011) Carvedilol compression coated tablet formulation development. 1–10, Pharm Dev Technol.

[17]. Tang Y, Teng H, Shi Y, He H, Zhang Y, et al. (2018) Paliperidone tablets with compression coating for controlled ascending release. A Journal of Pharmaceutical Sciences, vol. 13, no. 1, pp. 143–154.